BID DOCUMENTS

FOR

DEDICATED FREIGHT CORRIDOR PROJECT
(Western Corridor, Phase : 1 Rewari – Makarpura (Vadodara)

ELECTRICAL AND MECHANICAL WORKS

CONTRACT PACKAGE – 4

ICB No. EM P-4 : Rewari – Makarpura (Vadodara) Section

Volume II : Employer's Requirements

Section 8: General Specification

Employer:

Dedicated Freight Corridor Corporation of India

(A Government of India Enterprise)

Consultants
NK Consortium
NK – JARTS – PBJ – NKI
Consulting Engineers

28TH MARCH 2013

BID DOCUMENTS

FOR

ELECTRICAL AND MECHANICAL WORKS

Contract Package 4

for

ICB No. EM P-4: Rewari – Makarpura (Vadodara) Section

(Traction Power Supply, OHE and SCADA)

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EMPLOYER'S REQUIREMENTS

1 GENERAL

1.1 Introduction

1.1.1 The 1st phase of the Western Dedicated Freight Corridor consists of 915 kms of double line electrified tracks with 2x25 kV AC, 50 Hz. Overhead catenary system from Vadodara to Rewari running along the existing Indian Railway Tracks.

Construction of the 1st phase of the Western Dedicated Freight Corridor has been planned through eight (8) Contract Packages encompassing the following Contracts :

CT P-1	Civil/Building/Track Works Rewari – Ajmer Section;
CT P-2	Civil/Building/Track Works Ajmer –Ikbalgarh Section;
CT P-3	Civil/Building/Track Works Ikbalgarh – Vadodara Section;
CT P-3A	Special Steel Bridges across Rivers Mahi and Sabarmati
EM P- 4	**ELECTRICAL AND MECHANICAL REWARI – VADODARA SECTION**
ST P-5	Signal & Telecommunication; Rewari – Vadodara Section
PE P-6	Plant and Equipment for Operation and Maintenance; and
RS P-7	Electric Locomotive cum Maintenance and Depot works.

1.1.2 Out of the total length of 915 kms, it is intended to first carryout the work between Ikbalgarh and Rewari in a length of about 626 kms and the section Ikbalgarh to Vadodara (Makarpura) of Package 3 about 289 kms in continuation thereafter. The route is to be constructed as double line electrified tracks with 2 x 25 kV AC, 50 Hz, overhead catenary system, capable of operating at a maximum train speed of 100 km/h with an initial axle load of 25.0 tonnes. Formation and bridge structures are to be provided for 32.5 tonnes axle load and track structures for 25 tonnes axle load. Provisions in the track and traction structures are to be kept to permit raising of track by 275 mm when the axle loads are raised to 32.5 t.

Ikbalgarh – Rewari stretch is located along Palanpur – Phulera and Phulera – Rewari lines of North Western Railway. Detour is planned at Phulera city for around 7 km length. The proposed alignment between Ikbalgarh - Rewari is located on East side of existing IR. The proposed alignment of DFC is passing generally parallel to the existing IR network between Ikbalgarh and Rewari. The alignment of DFC is taking detour to avoid city congestion at Phulera. Almost 90% of the proposed DFC alignment is passing parallel to existing IR network and 10% of the alignment is passing through detours.

Ikbalgarh - Vadodara : The proposed alignment of this section consists of two parts viz.

a) Ikbalgarh – Pansar (134 km) Section located along Ikbalgarh – Palanpur – Jagudam – Pansar lines of North Western Railway/ western railway. The Ikbalgarh – Jagudam section of the alignment runs on Eastern Side of North Western Railway/Western Railway whereas the Jagudam – Pansar Section of the alignment runs on Western side of Western Railway; and

b) Pansar – Vadodara (Makarpura) (155km) section takes detours from the existing Western Railway tracks.

1.1.3 **Works Content of package EM P-4**

The Contractor is required to undertake the design, based on their computer simulation of train operation for the traffic to be hauled over the section, supply specifications for procurement of components, manufacture, verification, delivery, construction, installation of equipment, testing including integrated testing, and commissioning, technical support, supervision of maintenance, training of employer's staff and documentation for a complete

system necessary to provide Traction Power supply from 220 kV Traction Substations, through 2 X 25 kV Traction Overhead contact lines (OHE) capable of running double stack containers on flat wagons, complete with a Supervisory Control and Data Acquisition System (SCADA) for running trains hauled by 9000 h.p. electric locomotives, a proportion of which will also be in long haul (two train) formation on the Western dedicated Freight Corridor for a projected freight traffic in the year 2031.

1.1.4 The Employer's Requirements of the current package are divided into six (6) sections as follows:

(1) **General**: these apply throughout the Contract;

(2) **Functional**: these include the specific requirements for the design, construction, performance and function of the Works including Scope of Work;

(3) **Design**: these apply in respect of duties relating to the design of the Works;

(4) **Construction**: these apply in respect of the requirements relating to the construction of the Works;

(5) **Manufacturing, Installation and Testing**: these apply to the requirements relating to manufacturing, procurement and delivery of plants, equipment and manufactured items, their installation and the requirements for testing and commissioning; and

(6) **Appendices**: these provide further requirements to the above.

1.2 Definitions, Abbreviations and Interpretations

1.2.1 Definitions and Interpretations

In addition to the words and expressions defined in the Conditions of Contract, following words and expressions shall have the meaning assigned to them except where the context otherwise requires:

- **"Access Dates"** for the Contractor are dates that are to be achieved by the Other Contractors which are considered essential to the completion of the project to original planned schedule. A list of activities completion of which are considered to give rise to an Access Date are included in Vol. I Section 5 – Conditions of Contract.
- **Alignment Drawings**: mean one of the Employer's Drawings (see "Employer's Drawings") showing the indicative horizontal and vertical alignment for the whole main line, connecting lines including loop lines, sidings (yard layout) for each Station and depot line as developed by the Employer and collectively referred to as 'Alignment Drawings'. This forms the basis of initial design of the alignment and construction by the Contractor for traction Power Supply and Overhead Equipment installation Works within the available Right of Way.
- These drawings have been included in the documents to enable the Contractor to be familiar with the route. so as to help design the electric traction system for the route.**.**
- Only at the stage of Co-ordination Event CT- 3 of Civil and Track Works Contracts, the Final Alignment Drawings shall be available for designing the traction structures for the Permanent works.
- **As Built Documents**: mean the set of drawings and documents prepared by the Contractor as one of the five major design submissions (Inception Report, Traction Simulation Report, Basic Designs, Construction Design and As-built Documents) during Design Phase and Construction Phase.

- **Auto-Transformer Stations (ATS)** is a post where auto transformers are located along the line at various locations for the purpose of regulating line voltage along the track close to 25kV by sharing load between the contact / catenary wire and feeder wire.
- **As-Built Drawings**: mean those drawings produced and endorsed by the Contractor as true records of construction of the Permanent Works. The As-Built Drawings are subject to confirmation and issue of a "Notice of No Objection by the Engineer".
- **Construction Phase**: means phase of the Works during which the Construction Design and Construction Technical Drawings for physical construction of the Permanent Works shall be undertaken by the Contractor as per the Employer's Requirements, Specifications and other Conditions of the Contract. It has been further detailed in Chapter 4 of the Employer's Requirements – Particular Specification.
- **Construction Drawings/Construction Technical Drawings**: mean those set of drawings in respect of each element of the Permanent Works prepared by the Contractor as part of the Construction Design and to be used for construction of Permanent Works and shall be derived directly from the Technical Design and Technical Drawings for which 'Notice of No Objection' has been received from the Engineer. The Construction Technical Drawings / Construction Drawings shall be used only after issue on 'Notice of No Objection' from the Engineer and endorsement of 'Good for Construction' as per the process detailed in Para 4.5, Design Submission Requirements in Vol. III Section – 9, Employer's Requirement – Particular Specifications. These have been further explained in the Employer's Requirements – Design.
- **Construction Design**: means a set of design, drawings and documents in respect of each of the element of the Permanent Works, which shall be prepared by the Contractor during Construction Phase as part of the Construction Design Package based on which the Contractor shall undertake the construction of the Permanent Works. Construction Design shall be developed directly from the Technical Design and Technical Drawings for which 'Notice of No Objection' has been received from the Engineer and submit the same to the Engineer in accordance with Para 4.5. - Design Submission Requirements, Employer's Requirements – Particular Specifications.
- **Construction Design Package**: comprises the Construction Technical Drawings, Works Specification, Working Drawings and all other associated documents necessary to supplement the design covered in the Technical Design and to comply with the Contract regarding the construction of the Works such as detailed Method Statement, Safety Risk Assessment etc. The contents of the Construction Design Package are as defined in Para 4.5. - Design Submission Requirements, Employer's Requirements – Particular Specification.
- **Coordinated Construction Programme**: means the most precedent programme above all sub-programmes prepared by the Contractor for execution of the Works in co-ordination with Other Contractors describing all the activities of the Works, Co-ordination Events and physical areas to which the Other Contractors will require access within the Completion Period as specified in the Contract. Coordinated Construction Programme has been further detailed in Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements.
- **Contractual Construction Programme**: means the most precedent detailed programme above all sub-programmes as developed by the Contractor covering the whole scope of the Contract and based on the Bid Programme for execution of the Works within the specified completion period. Contractual Construction Programme has been further detailed in Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements.

- **Design Manual**: means the manual to be prepared and submitted by the Contractor as part of the Design Submissions and as described in the Employer's Requirements – Particular Specification, Design Requirements**. (Sub-clause 4.5.6)**
- **Design Phase**: means phase of the Work during which the detailed design of the Permanent Works and Temporary Works shall be undertaken by the Contractor as per the Employer's Requirements, Specifications and other Conditions of the Contract. It has been further detailed in sub Clause 1.8.10 [Design Submission Programme] of this Employer's Requirements – General Specification and Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements – Particular Specification.
- **Design Data**: means the data as identified to be required by the Contractor for design of the Permanent Works
- **Employer's Drawings**: express the Employer's concept and/or intent, function, purpose and structural form of the Permanent Works.
- **Final Alignment Drawings**: showing the final horizontal and vertical alignment for the whole main line, connecting lines including loop lines, sidings (yard layout) for each Station and depot line as checked and prepared by the Other Contractor for Contract packages Nos. CT P-1, CT P-2, and CT P-3 and **approved by the Employe**r on occurrence of Co-ordination Event No CT -3.
- **Inception Report: means** the set of drawings and documents prepared by the Contractor as one of the four major submissions during the Design Phase and Construction Phase as identified in Employer's Requirements – Particular Specifications, sub clauses 3.5 and 4.5.4.
- **Internal Authorization Process**: means one of the core quality management systems established by the Contractor as described in clause 1.11 of [Quality Assurance Requirements] to this Employer's Requirements.
- **Operation and Maintenance Manuals (O&M Manuals)**: mean the manual indicating the additional provisions over and above the existing Manuals of Indian Railways for Operations and Maintenance of various assets created and shall be prepared as part of the As-Built Documents.
- **Interfacing Parties:** comprises the designated Other Contractors / consultants / service providers other agencies /contractors, who are engaged in part of the Works as well as relevant statutory authorities, relevant public utility agencies and adjacent contractors who are or will be working adjacent to the Site.
- **Other Contractors**: mean one to all of the contractors as mentioned in para 1.1 above except the Contractor.
- **The Project** : means the Dedicated Western Freight Corridor Phase I : from Vadodara to Rewari
- **Railway:** means Railway or any portion of a Railway for public carriage of passengers and goods as defined in the Railway Act 1989. Any reference to railway means the Indian Railways and the respective Zonal Railways.
- **Railway Envelope:** means the area within the Right of Way (ROW) as required for the safe operation of the railway.
- **Right of Way:** means the width / area of the land as required and / or acquired for the operations of the railway. Right of Way for DFC has been indicated in the Statement of ROW for Contract Packages CT P-1, CT P-2 and CT P-3 and is included in Data Book Volume IV.
- **SHE Requirements**: contain major items with respect to environmental and social considerations, and safety and health considerations for all parties involved in the Contract in particular and public in general.

- **Site**: means the area where the Permanent Works are executed in the Right of Way or adjoining the Right of way for location of traction Power Supply and Control Installation or any other area nominated by the Employer for associated Works. (see the Work Areas clause 2 of Appendix -1 to this Employer's Requirements).
- **Specifications**: stipulate the Employer's specific requirements for the Works under the Contract. The Specifications given by the Employer shall be developed into the Works Specification by the Contractor (see sub clauses 4.5.13 and 4.5.14 of Employer's Requirements - Particular Specification – Vol. III).
- **Sectioning Post (SP**) is a Switching Station where the traction Power Supply from two adjacent traction substations are sectioned and is located opposite a Neutral Section.
- **Sub-sectioning Post (SSP)** is a switching Station where the traction Supply is sectionalized and Paralleled. This is located between the TSS and SP as required.
- **Technical Design**: means a set of drawings and documents, which is submitted to the Engineer in accordance with the Employer's Requirements-Design and Specifications.
- **Technical Design Package**: Contains the "Technical Design" and its **Supporting Documents** including various reports including Train Simulation Report, plans, methods and schemes, calculations, analysis, Manuals, Works Specifications etc. for the Permanent Works and Temporary Works submitted by the Contractor to the Engineer for his approval in accordance with the Employer's Requirements. The design of Traction Power Supply, Supervisory Control and Data Acquisition System (SCADA) and OHE shall be based to the extent possible on the Indian Railways Codes, AC Traction Manual, Design Manual for Electric traction and other Manuals, IS Codes, IRS Codes (as applicable), other International Codes (as applicable) and as referenced to in the Specifications, and any improvements as previously agreed upon.
- **Traction Over Head Equipment (OHE)**
- **Traction Substation-** means the Substation receiving Traction Power from Local Electric Supply Utility's EHV Grid Substation at 220/132 kV and converting this power to 50/25 kV, through traction transformers and auto-transformers for Electric traction to the Electric Locomotives.
- **Traction Supply Control Post:** is a generic term for Switching Stations to control the traction power supply to the overhead equipment. Such control equipment are located in Traction Substations, Sub-sectioning Posts, Sectioning Posts and Auto Transformer Stations for operational purposes to sectionalize and control traction Power Supply for running electric locomotives through switchgear remote controlled from OCC through SCADA.
- **Work Areas**: comprise the Site (see "Site") and areas for the Temporary Works within and outside the Right of Way.
- **Works Segment**: means the subdivided section / stretch of the DFC Right of Way identified by the Contractor for ease of managing and optimum utilization of resources for Design and Construction of the Permanent Works. Size of the Work Segment shall be as consented by the Engineer and approved by the Employer.
- **Works Specification**: means the final Specification used for the construction of the Permanent Works. The Works Specification shall be developed by the Contractor based on the Specifications issued by the Employer as his requirements.
- **Works Programme:** means the programme showing the sequence and timing of investigations, design, execution, manufacture, installation, testing, commissioning of the Works (including Integrated Testing and Commissioning), indigenization (where applicable) and related activities in the form and content prescribed by the Employer's Requirements, or any amended or varied version thereof, as submitted by the Contractor and for which the Employer's/Engineer has issued a Notice of No Objection.

Yard / **Station Yard:** For OHE the Yard / Station Yards are defined by the track layouts within the outermost points of crossovers on the main running tracks at two ends of the Station.

1.2.2 Abbreviations:

All the Common abbreviations, Governing Specifications and Climatic conditions used in the Bid Documents for Contract Package EM P-4 are furnished in Chapter 19 of Employer's Requirements – Particular Specification. The Contractor shall exercise great care that the abbreviations are not used out of context when communicating with the Employer/ Engineer.

1.3 Relevant Documents

1.3.1 Relevant documents within the Employer's Requirements comprise the documents entitled Employer's Requirements (Volume II General Specification - of the Bid Documents), Design Criteria and in Specifications, as included in Employer's Requirements – Particular Specifications Volume III of the Bid Documents) in this Contract.

1.3.2 In the event of a conflict between provisions of the above, the order of precedence shall be as under :

(a) Employer's Requirements: Particular Specifications (Volume III of the Bid Documents)
(b) Employer's Requirements: General Specifications (, Volume II) of the Bid Documents)

Notwithstanding the precedence specified above, the Contractor shall always seek advice from the Engineer in the event of any conflict, immediately for a final decision.

1.4 Codes and Standards

1.4.1 The design and construction of the Works shall comply with the Relevant Documents and other relevant codes and standards as applicable and consented by the Engineer.

1.4.2 Notwithstanding the precedence among the Relevant Documents as described within the Employer's Requirements herein, the overall precedence in the Contract shall be as stated Clause 1.5 [Priority of Documents] of the Conditions of Contract in (Vol. I Part B – Particular Conditions)

1.4.3 In the event of a conflict between the Design Criteria and any other standards or specifications, the Design Criteria as included in Employer's Requirements - Particular Specifications – Vol. III shall prevail.

1.4.4 The Contractor is responsible for obtaining prior approval from the Engineer for any alternative or additional Codes of Practice and Standards.

1.4.5 Notwithstanding the precedence specified above, the Contractor shall always seek advice from the Engineer in the event of any conflict, immediately for a final decision.

1.5 Employer's Drawings

1.5.1 The Employer's Data and Drawings are attached in Volumes IV & V [Employer's Data and Drawings respectively] in this Contract Package to express the Employer's concept and/or intent bearing functions, purposes and structural forms of the Permanent Works.

1.5.2 General features of those drawings are described below:

(1) Alignment Drawings

The Alignment Drawings basically contains the Indicative Horizontal and Vertical Alignment of the Track-ways for the whole Mainline, Connecting Lines, Loop Lines, Sidings (yard layout for each Station) and connecting lines to IR etc. under the Contract; and also the Definite Right of Way (ROW) available all along the Alignment including the Junction / Crossing Stations in line with the list of ROW attached as Attachment 1 to the Scope of Work included in Employer's Requirements. The Alignment Drawings enclosed in the Employer's Drawings are indicative and are further subject to confirmation by the Other Contractors for track and civil works for packages CT P-1, CT P-2 and CT P-3 as applicable.

The Contractor shall, however, design the Traction Equipment based on the Final Alignment Drawing. He will further be responsible for verifying its correctness for his own designs portion of the Design stipulated in the Particular Specifications in Volume III under the Contract. The Contractor will further, based on the Final Alignment Drawings of the Other Contractors for CT P1, CT P2 and CT P 3, prepare his continuous Chainages, commencing from Rewari End for applying that to the Design of the Traction Supply Diagram and the OHE Layout Plans

The Contractor shall also ensure that during the Technical Design development his design of the Works including, but not limited to, Traction Over head Equipment, Traction Power Supply Installation, and SCADA Works and any structures adjacent to or traversing across the alignment is to be consistently developed without infringing the Right of Way, the Structure Gauge and the Clearances as stipulated in the Specifications

Diversion of 33 kV and below power line crossings are within the Scope of Works of the Other Contractors for Civil Works and Track. Power Line crossings at higher voltages and other Public Utilities shall be modified or diverted by other parties appointed by the Employer to suit Electrification work. The Contractor shall take up suitable technical designs for the Works in the vicinity of these utilities in close interface with these parties to enable safe designs for passage of electrical conductors and equipment at these locations.

The locations as indicated are only approximate. It is the Contractor's sole responsibility to verify their precise nature and location before undertaking the Technical Design.

(2) General Drawings – Contains the general map of the alignment route and the Site location map,

(3) General Arrangement Drawings (GAD)

The General Arrangement Drawings (GADs) are a set of reference drawings which shows the Employer's concept of each Permanent Works above are indicative and for reference only. These shall be further developed by the Contractor as part of Technical Design and, where relevant, coordinated with Other Contractors and shall include :

1. **Traction Power Supply and OHE Drawings**: – Containing the indicative:-

   (a) General Supply Diagram on a basis of Section Chainages of Field Units of the Employer and converted to a continuous chainage commencing from Rewari end. The chainages shall be site verified before taking up any Design Work.

   (b) Schematic Drawings for Traction Substations, Sectioning Posts and Sub-sectioning posts and Auto-transformer stations.

   (c) Yard Wiring Plans cum Sectioning Diagram for all the Junction and

Crossing Stations.

(d) Standard Typical Arrangement Drawing for an OHE Structure on an embankment and in a Cutting.

(e) OHE Structures on bridges and viaducts

1.5.3 Validation of Data & Additional Surveys

(1) The Contractor shall plan and programme for the validation of the drawings and data provided by the Employer and conduct additional surveys if required.

(2) Survey for Earth Resistivity and Electromagnetic Interference from AC traction currents for mitigation measures of adjacent circuits and ensuring safety.

Special precautions and preventive measures which may become necessary against EMI for any adjacent continuous metalwork such as fencing, wires and cables affecting safety to the public or to the circuits from induction effects of 2 x 25 kV ac single phase traction currents or for foundation designs for the Traction Structures, passage of OHE through overline structures ,those affecting adjacent IR lines in operation or any other purpose as considered necessary. The Contractor shall carry out his own independent survey and inform the Employer of the results of such survey recommending the mitigation measures which may become necessary based on Contractor's Traction Power Computer Simulation Study. The Contractor shall design and provide the mitigation measures for the entire installation to be provided by him. In regard to the mitigation measures to be taken on the installation of outside bodies and Indian Railways, the Employer shall decide the agency through which such mitigation measures shall be taken up.

(3) Based on the final validation Survey and additional survey the contractor shall formulate a proper preliminary design parameters for finalizing the Construction designs.

1.5.4 Auxiliary Works

It shall be the Contractors responsibility to provide all the auxiliary works and take precautions necessary to ensure that the survey works are accurate, accountable and secure. The Contractor shall ensure but not limited to performing all necessary calculations in a clear presentation of computations and results in order to facilitate verification by the Contractor himself and by the Engineer of the results arrived at. If any computer simulations have been performed the basis, formulae and the constants adopted shall be indicated justifying their use.

1.6 Specifications

1.6.1 The Specifications contained in the Contract shall be considered as the Employer's specific requirements for the Works. On furnishing and acceptance of the Computer based Train Simulation and establishing the traction equipment ratings the basic concept and typical general Specifications given by the Employer shall be developed into the Works Specification/ the Method Statements and plans / programs / relevant documents describing work procedures etc. by the Contractor during the Design Phase and submitted as part of the Technical Design Package and the Construction Design Package. When the Works Specification/ the Method Statements/ the work procedures has received a Notice of No Objection to the Construction Design Submission from the Engineer, it shall be used for construction execution. In any case, the Works Specification shall be deemed to comply with the Specifications and other precedence under the Contract.

1.6.2 The Contract shall utilize the SI system of units, Codes and Standards in imperial units shall not be used unless the Engineer has given his consent.

1.6.3 Conversion between metric units and imperial units shall be in accordance with Indian Standards.

1.7 Design and Construction Phases

1.7.1 The Contractor shall execute the Works in two phases - the Design Phase and the Construction Phase.

1.7.2 The Design Phase shall be in 5 Phases divided in Part A and Part B. Part A encompasses two phases, the First phase commences from the start of the Commencement Date and shall include the Inception Report and completion and submission of the train and traction power Simulation Report. Part B covers three phases, the basic designs based on the Simulation Report in the third Phases as the basis for construction work, followed by the Construction Designs in the 4th Phase and Engineer's No Objection to such designs. This shall permit construction work to commence. Thereafter, Construction works shall closely follow the Designs. Commencement of the Field works shall be taken up on access to site being made available by the Other Civil and Track works contractors as provided in Section 5, Conditions of Contract Vol. I of the Bid Documents. Thereafter, the Construction Technical Designs and Drawings shall precede progress of Construction and Installation of Traction Works. The As Built Designs and Drawings submitted at completion of Works as the 5th Phase will denote the completion of Final Design Phase – (Refer clause 4.5.10 & 4.5.15 of the Employer Requirement – Particular Specification)

1.7.3 The Design Phase shall be considered complete upon the issue of a "Notice of No Objection" in respect of the last Technical Design Submission, to be submitted not later than the Coordinating Event as described in Volume I of the Bid Documents and comprehensively and completely forms the Technical Design for the whole of the Works.

1.7.4 The Construction Phase for the whole or a part of the Works shall commence immediately upon the issue by the Engineer of a Notice of No Objection in respect of the relevant Construction Technical Design Submission, subject to the availability of the Site in accordance with the agreed programme for site hand over by the Employer. Such Notice may be issued by the Engineer in respect of a Technical Design Submission covering a major and distinctive part of the Works in accordance with the Design Submission Programme, which is deemed to be part of the Contractual Construction Programme as described in [Project Programme Requirements] Clause 1.8 of this Employer's Requirements. However, construction shall not be commenced until the appropriate Construction Technical Drawings and other documents forming the Construction Design Package have been endorsed as "Request for Construction" through the Contractor's Internal Authorizing Process and the request is approved by an issue of "Notice of No Objection" by the Engineer in accordance with the procedures in the Employer's Requirements - Design.

1.7.5 The Construction Phase shall include the completion and submission of the Construction Design and the As-Built Documents. Construction Design shall include the Design Manual to enable review of the Designs of the Works by the Engineer. The requirements for the Construction Design and As-Built Documents are stated in Clause 4.4 [[Basic Design Philosophy and Requirements for Design] of the Employer's Requirements – Particular Specification and sub clause 1.8.10 [Design Submission Programme] of this Employer's Requirements.

1.8 Project Programme Requirements

1.8.1 The Coordination Dates are defined in the Coordination Events in the Conditions of Contract (Volume 1 of the Bid Documents).

1.8.2 The Programme has the following three main purposes in three respective phases of the Contract procedure. Those purposes on respective phases are clarified as follows:

(1) Bid Programme

The proposed program by the Bidder during the bidding process shall be used for evaluating the Bids and used to develop the contractual agreement between the Employer and the Contractor.

(2) Contractual Construction Programme

The Contractor shall submit a detailed time programme to the Engineer for his consent within 28 days after the Commencement Date. While preparing this, the Contractor shall duly consider his various obligations including but not limited to the train operations on the existing Indian Railway tracks, shared Site areas with the Other Contractors, Co-ordination Events and Dates etc. This programme shall be supplemented and developed at the time of the Inception Report. However supplementing the same shall not relieve the Contractor of his obligation to adhere to the Time for Completion and Co-ordination Dates as specified in the Contract. Upon consent by the Engineer to this programme, it shall be referred to as the Contractual Construction Programme, and become an integral part of the Contract.; and

(3) Works Programme and Supporting Reports

Based on the Contractual Construction Programme, the Contractor shall submit sub-divided and detailed programmes in respect of all the Work Segments as defined in Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements - P.S. and clause 1.8.10 [Design Submission Programme] of this Employer's Requirements, along with status reports of the Works to the Engineer for checking and monitoring the Works. Each programme produced and submitted to the Engineer shall be a detailed time window of the Contractual Construction Programme.

1.8.3 Methodology

(1) Unless otherwise instructed by the Engineer, the Programme shall be in the form of a Critical Path Method (CPM) Network showing critical path along with the Narrative Statements. The programme shall also be submitted in the form of a Time Bar-chart showing a Critical Path and S-curve (cumulative progress in percentage). The Time Bar-chart Schedule shall list all main activities and connected sub-activities

(2) The CPM Network shall be prepared in accordance with commonly accepted practices and shall show graphically the chain of activities/sub-activities and their sequential relationship with each other from the Commencement Date to the day of issue of Taking-Over Certificate. It shall include all activities with their durations along with earliest and latest event times, free and total floats, dates of submission of the Contractor's drawings, process for procurement of equipment and components, their tests and expected approvals each date of inspection by the Engineer for the Works Segment or part of the Works; and shall meet the provisions of the Contract in all respects. It shall be noted that the Contractor does not have an exclusive right to use free and total floats without consent of the Engineer.

(3) In preparing the CPM Network and the Time Bar-chart Schedule showing a Critical Path and S-curve, the Contractor shall make due allowances for reasonably foreseeable delays, which may be caused by floods, inclement weather, all types of holiday periods, local working conditions, problems relating to performance of tests including type tests when called for maintenance of equipment, problems relating to obtaining of materials/supplies, trial runs, and similar items. Under no circumstances shall the CPM Network or the Time Bar-chart Schedule show a completion date beyond the of issue of Taking-Over Certificate

1.8.4 **Coordination Event and Coordination Date**

For the sake of timely overall implementation of the Works, the Contractor shall execute the Works within the specified time window available on being given access to site necessary for the Other Contractors within a specific time window delimited by the Coordination Date so as not to hinder the Other Contractors from executing their works within their time

window smoothly. All the programmes shall meet the Coordination Dates, each of which corresponds with each Coordination Event defined in the Conditions of Contract in Clause 1.1.3.10 and the date of which are enumerated in the Appendix to Bid (Table: Coordination Events) in the Contract.

1.8.5 **Bid Programme**

(1) Contract Stages :

The Contractor shall divide the Work in to various stages. Completion of these stages shall be linked with the designated Co-ordination Events and Dates, as indicated in the Conditions of the Contract and Clause 3.10 of [Requirements for submission of Documents and Drawings] and table 3.10-2 of the Employer's Requirements -- Particular Specification. For the purpose, the Contractor shall elaborate a comprehensive schedule for achieving the same and shall include, but not limited to, the following;

(a) stage Identification
(b) the Co-ordination Events and Date
(c) the Interfacing Parties
(d) related bodies and / or organizations and their protective works / Certification and / or approval
(e) works to be performed and / or actions to be taken before the Co-ordination Date
(f) intended achievements

(2) The Bid Programmes shall meet the Coordination Dates, each of which corresponds with each Coordination Event defined and clearly indicate sequence in which the Bidder proposes to execute the Works. The Programme shall recognize realistic review and approval durations for both the Engineer and any external agency which may impose authority on the Works.

(3) The Programme shall be totally comprehensive and detailed as much as possible covering all major activities in the Design Phase and the Construction Phase. Activities of the Works shall be supported by and correlated to information detailed by the Technical proposal concurrently submitted by the Bidder.

(4) A critical path analysis shall be made identifying all critical path activities and their relationship to other tasks. The critical path shall be clearly identified and recognized in the programme and fully described in the accompanying programme narrative. Each activity description shall succinctly convey the nature and scope of the work in each stage.

1.8.6 **Contractual Construction Programme**

(1) The Bid Programme submitted during the bidding process shall be further developed and submitted to the Engineer within 28 days after the Commencement Date. Upon consent by the Engineer, it shall be referred to as the Contractual Construction Programme which shall serve as the base against which the Contract progress shall be monitored. The Contractual Construction Programme shall supersede all other programmes submitted earlier and shall be deemed to be the programme on which the Contractor has based his Accepted Contract Amount and in accordance with which he will execute the Works within the specified Time for Completion.

(2) The Contractual Construction Programme shall be of utmost priority programme. Other programmes are deemed in respect of structure / priority, a particular time window taken from the Contractual Construction Programme and detailed in terms of their purposes.

(3) If, at any time, actual progress is too slow to complete in the Time for Completion, and/or progress has fallen (or will fall) behind the current Contractual Construction Programme, then the Engineer may instruct the Contractor to submit a revised Contractual Construction Programme and supporting report describing the revised methods and resources which the Contractor proposes to adopt in order to expedite progress and to complete the Work within the Specified Time for Completion as stipulated in Clause 8.6 [Rate of Progress] in the Conditions of Contract.

(4) Any changes to the Contractual Construction Programme shall be subject to the consent of the Engineer and shall not relieve the Contractor of his responsibility to complete the Work within the Time for Completion as per the Contract

1.8.7 Works Programme

(1) The Contractual Construction Programme shall be divided into sub-programmes of the Work Segments, as defined in Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification and sub clause 1.8.10 [Design Submission Programme] of this Employer's Requirements of manageable sizes addressing in more specific detail and/or in more specific issues and they are collectively referred to as Works Programme. The Works Programme is categorized as follows:

(a) Survey Programme for validation of the Data provided by the Employer and additional survey such as for mitigations and EMI studies of adjoining structures and Indian Railways Establishments as considered necessary by the Contractor for his specific Designs requirements.;

(b) Simulation and basic design submission programme.;

(c) Construction Design Submission Programme;

(d) Construction Programme;

(e) Coordinated Construction Programme;

(f) Temporary Facilities Programme; and

(g) Tests on Installation and their Commissioning Programme.

(2) The Works Programmes may be further substantiated by supplementary programmes upon request by the Engineer such as three months Rolling Programmes addressing in more detail for an imminently forthcoming time window (weeks or months.) First three months rolling programme shall be submitted as part of the Inception Report.

(3) All the Works Programmes shall be submitted to the Engineer for consent at the timing specified in Clause 3.10 [Requirements for Submission of Documents and Drawings] of Employer's Requirements -- Particular Specification.

1.8.8 Programme Requirements

The Contractor's Works Programme and all other programme in the Contract as applicable shall comply with the following requirements unless otherwise instructed by the Engineer:

(1) all programmes e.g. design and/or construction work, including all subcontractors' work, under this Contract shall be prepared, scheduled, executed and reported using the latest version of CPM scheduling software of Primavera Project Planner. other equivalent software such as Sure Track, Microsoft Project etc. may also be used subject to the consent of the Engineer and provided that the system is compatible and capable of direct file interchange with the software programme being used by the Employer. Such interchangeability shall have to be demonstrated

in the Contractor's Proposal as well as before start of the Work to the entire satisfaction of the Engineer / Employer. In such a case, the Contractor shall supply to the Engineer and Employer with the Original licensed copy of the said software including manuals and training and subsequent versions thereof at no extra cost to the Employer.

(2) All programmes shall be accompanied by a Programme Analysis Report as described thereafter;

(3) the Contractor is responsible for determining the sequence of activities, the time estimates for the detailed design and construction activities and the means, methods, techniques and procedures to be employed. Time schedules identified herein shall represent the Contractor's best judgment of how it will execute the Work in compliance with the Contract requirements. The Contractor shall ensure that the time schedule is current and accurate and is properly and timely monitored, updated and revised to accommodate with current project conditions and in compliance with the requirements in the Contract.

(4) a standard Gregorian calendar shall be used for planning and execution of the Works. All programme submissions shall include details of the Contractor's allowance for public holidays and non-work periods. If a Coordination Date falls on a Public Holiday or non-work day, it shall be effective the next working day;

(5) CPM programmes shall reflect status using remaining duration and percent complete;

(6) all programmes shall be fully resource loaded as appropriate or required by the Engineer covering all stages and aspects of the Contract and shall include, but not be limited to:

(a) major manpower for both design and installation;

(b) number of itemized Contractor's equipment;

(c) drawings and other design deliverables;

(d) principle quantities of components or parts;

(e) principle quantities of major equipment, components, conductors, insulators and other fittings inclusive of steel, concrete, cabling, =, etc. and

(f) sub-contractor's deliverables

(7) Each activity shall be coded to indicate, as a minimum, the work group or entity responsible for the activity, the area, facility or location when the Other Contractors or other entities are involved and

(8) All the activities including manufacture tests and delivery of critical items or components, and Coordination Dates shall be coded so as to be separately identifiable. The Contractor may be required to assign additional activity codes as required by the Engineer. The Employer is developing a Project Management Information System (PMIS) for the whole of the Project, the Contractor should ensure compatibility of his programme with the Employer's PMIS.

Respective Works Programme shall be identified and detailed in the categories as specified herein below:

1.8.9 Survey Programme for Validation of Data and Additional Survey

The Contractor shall prepare a Survey Programme for validation of data provided by the Employer and additional survey in regard to geo-technical requirements, survey of structures, circuits in vicinity including that on the adjoining IR installations, measurement of earth resistances with respect to EMI emanating out of 2 x 25 kV AC traction System and their mitigation measures required. This will be required to develop his intended Technical Design in a reasonable time within the agreed Contractual Construction Programme. The

Programme shall also indicate duration of "Access to the Site" for every stretch and area all along the Alignment. The Survey Report shall also contain a submission of all the data and results of the survey including the Site Location Maps, the earth resistivities and type of soil for foundations of equipment and structures

1.8.10 **Design Submission Programme**

(1) The Contractor shall, within 60 days after the Commencement Date, submit a Design Submission Programme covering all required submissions in the Contract to the Engineer as described in Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification.

(2) The Design Submissions Programme shall include each submission for every item as indicated in relevant provisions in the Employer's Requirements and as summarized in respect of major (but not necessarily exhaustive) submissions in Sub. Clauses 1.10.25 and 1.10.26 of this Employer's Requirements.

(3) The Design Submissions Programme shall ensure that all submissions are properly coordinated with the Contractor's overall Works Programme, particularly in respect of the following:

(a) The System Designs for Electric traction Installation for satisfactory transportation of the freight as proposed for the route in the horizon year (2031).

(b) Progress of design, manufacture, construction, installation and testing work;

(c) Co-ordination with the Other Contractors and statutory bodies; and due allowance for the Engineer's review process, including the time needed for any re-submissions.

1.8.11 **Construction Programmes**

(1) The Construction Programme shall in general consist of the Construction Programmes for the works of Traction and Auxiliary Power Supply, OHE and SCADA, being parts of all the Work Segments.

(2) The Construction Programmes shall be identified by the distinctive names and / or numbers. Covering separately :-

(3) **Overhead equipment: for wiring of tracks:** Foundations, Mast Erection, Bracket erection, Wiring, Stringing of feeders, earth wires, catenary and contact wires: their adjustments, earthing and bonding. The programmes for all the major activities in respect of each segmented stretch of the alignment shall be submitted to the Engineer for consent

(4) **Traction Substations, SPs, SSPs and AT stations :** Preparation of land, foundations, buildings roads leveling drainage fencing, building construction, structure erection, bus-bar and conductors, equipment erection, Transformers transport and installation, tests and any other allied activity vital to completion of the work etc.

(5) **SCADA** works for remote control and monitoring of the traction system from a centralized operations control centre.

1.8.12 **Coordinated Construction Programme**

(1) The coordination with Other Contractors and other entities shall be the sole responsibility of the Contractor. The contractor shall submit the coordinated construction programme not less than 3 months before the start of the respective construction activities for check and monitor by the Engineer.

(2) The coordinated construction programme shall include detailed activities describing all aspects of the access dates on completion of works of Other Contractors and other entities to meet all coordination dates given in the Contract and clearly linked to the other Works Programme of Other Contractors. The coordinated construction programme shall indicate the physical areas to which the Contractor requires access, with access date, duration required and the required degree of completion of the Works prior to the access dates by the Other Contractors.

(3) It is the Contractor's responsibility to ensure timely co-ordination with the Other Contractors to review, revise and finalize his Work Programme so as not to affect the progress of Works/ and or the works of the Other Contractors.

(4) The Contractor shall note that the following conditions apply to the works of the Other Contractors:

(a) the Other Contractors shall not have exclusive access to any part of the Site except by the specific consent of the Engineer;

(b) the Contractor shall take note that concurrent time allocations for certain areas may be given to more than one contractor. The Contractor shall coordinate the Work in such areas with the works of Other Contractors / Interfacing Parties and report to the Engineer for his review / consent;

(c) the absence of a programme date or installation period for the other contractor and / or other relevant entities in a specific area shall not prejudice the right of the Engineer to establish a reasonable programme date or installation period for that area; and

(d) the Contractor and the Other Contractors shall comply with the coordination dates and other successive activities specified in the coordinated construction programme.

1.8.13 Temporary Facility Programme

(1) The Contractor shall prepare programmes of all the major temporary facilities to be established and operated by the Contractor such as the site assembly testing and work train sidings and any other temporary facilities with relevant temporary services

(2) The programme shall include but not limited to, arranging the land, if required by the Contractor, including the land in the ROW for the temporary works (if requested by the Contractor to the Engineer). The programme shall also include payments to the land owners, royalty charges etc., with relevant approval process, construction, procurement of machinery and equipment, mobilization of core personnel and labour ; daily production and transportation of materials, as well as demobilization and reinstatement.

1.8.14 Procurement Programme for Manufactured Items

(1) Within 120 days after the commencement date, the Contractor shall submit the initial procurement programme for manufactured items to the Engineer for consent. Afterwards the Contractor shall update the Programme not more than 9 months prior to the first shipment of each item for imported items and four months for items sourced in India as an item-wise procurement programme to the Engineer for consent. The initial submission shall fully outline the succeeding Programme as instructed by the Engineer.

(2) The procurement programme shall show the interdependencies of Engineering disciplines between the Contractor and its sub-contractors and/or suppliers which provide the Contractor with major machinery, equipment and materials produced and/or assembled in their factories or any off-site manufacturing process, and shipped to the corresponding site by them.

1.8.15 Production and Shipment

(1) The Contractor shall carefully incorporate the activities which are subject to long lead time and/or component parts or items manufactured from countries outside India (if any) into the Procurement Programme.

(2) The procurement programme shall detail including but not limited to the following information for each major and significant component and shall include:

(a) Name and description detailing supplier/sub-supplier;

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

(c) the manufacturing process, manufacturing of test pieces, testing programme (type tests and factory acceptance tests), trial production, Engineer's inspection, monthly production of components and monthly supply of components;

(d) the assembly process, erection and assembly sequences (particularly for the first pieces) prior to shipment, test assemblies, monthly assembly requirement, Engineer's inspection, testing of assemblies; and

(e) transportation process, quality release from factory, factory storage, transportation.

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

1.8.16 Tests for Procurement and Commissioning Programme

Procurement programme shall also include testing programme. The testing programme shall include, but not limited to Type Tests wherever specifically required, the factory testing programme, and site tests.

(1) Type Tests : These shall be required for all new items as stated in the criteria mentioned at para 5.5.4 of GS. This programme for each item shall be clearly indicated in the procurement programme.

(2) Factory Acceptance tests(FAT)

The factory testing programme shall be fully detailed in the Procurement Programme, with activities individually identifying all tests for which a certificate will be issued, and shall include activities for preparation, submittal and consideration of the test procedures. It shall also demonstrate the logical dependencies and correlations between the other individual tests of the Works.

The factory testing programme shall include details of inspection, testing and witnessing of the Contractor's and subcontractor's procurement and manufacturing activities.

(3) Tests Performed on Site

The Contractor shall include the on-site testing programme as part of the Procurement Programme that shall fulfill all the on-site testing on the items which are produced and/or assembled in the manufacturer's and/or subcontractor's factory or any off-site manufacturing process, and shipped to the corresponding site by them.

The testing programme shall be fully detailed, with activities individually identifying all tests for which a certificate will be issued, and shall include activities for preparation, submittal and consideration of the test procedures.

(4) The Engineer will carry out the tests as prescribed in the respective codes before accepting any manufactured item for use in the permanent works and for the Temporary Works to the extent required for safety considerations.

1.8.17 Review and Monitoring of Programme

Programme Review

(1) The Contractor shall submit all programmes as required in the contract to the Engineer for consent.

(2) The Engineer shall, within 28 days of receipt of the initial submission of any programme for consent, either give a notice of no objection or provide specific details as to why a notice of no objection is not given. If the Contractor is advised that the programme is not given a notice of no objection, the Contractor shall amend the programme taking into account the Engineer's comments and/or requirements and resubmit the programme within 14 days.

(3) In the case of further re-submittals, the resubmission shall be made within 14 days after the notice.

1.8.18 Works Programme Revisions

(1) The Contractor shall immediately notify the Engineer in writing of the need for any change in the Works Programme, whether due to a change of intention or circumstances or for any other reason. Where such a proposed change affects the timely completion of the respective Works or any Stretch or Stage; the Contractor shall within 14 days of the date of notifying the Engineer submit for the Engineer's consideration his proposed revised works programme and accompanying Programme Analysis Report. The proposed revised works programme shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions on the Works and Other Contractors and their works.

(2) If at any time the Engineer considers the actual or anticipated progress of the work reflects a significant deviation from the works programme, he may request the Contractor to submit a revised works programme. Upon receipt of such a request the Contractor shall submit within 14 days a revised Works Programme, together with an accompanying programme analysis report and narrative statement, if any, including the reasons/repercussions of such deviations and the likely delays arising out of such deviations. The Contractor's resubmission of the programme shall demonstrate the means including deployment of additional resources etc. by which the Contractor shall eliminate the deviations and make good the delays occurred or likely to occur due to the same.

(3) Unless and until an amended version has the consent of the Engineer, the existing programme shall remain as the Works Programme for all purposes of the Contract.

(4) Consent by the Engineer to a works programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract, nor in the event that a Works Programme indicates that a Co-ordination Date or any intermediate targeted date has not or will not be met, and nor constitute any form of acknowledgement that the Contractor is or may be entitled to an extension of time in relation to such co-ordination date /intermediate target date. in any circumstances the contractual construction programme shall always prevail over other programmes and each of the other programmes shall be a detailed time window of the contractual construction programme.

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

1.8.19 Progress Monitoring

The Contractor shall monitor the progress and his Sub-Contractors' performance and against programmes to ensure its compliance with its obligations under the Contract. Monitoring of the Works shall include direct, daily monitoring of the progress of the Works and the preparation of written reports to be submitted to the Engineer. The reports shall include all necessary supporting data to apprise the Engineer of the status of the completion of the Works. The Contractor shall prepare the monthly progress reports covering all aspects of the execution of the works.

1.8.20 Programme Analysis Report

The Contractor shall submit a programme analysis report that shall, in narrative format, describe the basis and assumptions used to develop every programme. The Programme Analysis Report shall be prepared in a format having been considered without objection by the Engineer and contain as a minimum the following:

(a) cycle times and work sequences;

(b) the deployment of Contractor's Equipment and labor;

(c) the production rates used in determining duration;

(d) the shifts assumed in determining duration;

(e) the breakdown of labor requirements by trades;

(f) the schedules of quantities used in developing the programme, to the extent that such information is not provided elsewhere;

(g) interfaces with the Engineer and Other Contractors / Interfacing Parties and other constraints; and

1.8.21 Physical Progress (Earned Value) Report

(1) The Contractor shall prepare and submit monthly, a physical progress report based on earned value techniques. The Contractor's proposal for the physical progress report and basis for measuring progress shall be prepared in accordance with the requirements listed below and shall be submitted to the Engineer within 42 days after the commencement date.

(2) Selection of work activities

(a) Earned value progress reporting requires that the Contractor's work activities be broken down into discrete measurable units that are time phased (0% to 100% complete) in accordance with the Contractor's programme and maximum limit. These discrete measurable units shall be based on the physical deliverables and the prorata value of the items / milestones in order to summarize the activities into a planned percent complete curve. The format for presenting the earned value progress measurement information in a Physical Progress Report is to be considered by the Engineer.

(b) Coordination work activities with Other Contractors and other relevant entities for reporting progress shall be prepared by the Contractor and submitted to the Engineer for review / consent.

(c) To the maximum extent possible, activities shall be chosen which can be measured quantitatively rather than subjectively as the work progresses. In the event it is necessary to use activities that can only be measured subjectively,

intermediate activities or milestones shall be identified on the programme in which the Contractor shall establish a predetermined intermediate percent complete for the activity at attainment of each intermediate milestone. Such milestones shall be no more than one month apart.

(3) Activity weighting

In order to summarize the key individual activities into an overall planned or actual percent complete, activities shall be weighted. Various methods for determining the appropriate weighting can be used. The Contractor may propose an existing methodology comparable to the intent of the earned value concept. The Engineer will assess and, if appropriate, consider the method proposed by the Contractor. The sum of the weighting for all activities shall equal one hundred percent (100%).

(4) Revisions to Physical Progress Report

Once the weightings have been established, the planned progress curve shall be calculated and forms the basis of monitoring the progress of the Work. It shall not be changed unless there is a variation that significantly impacts on the programme. If, after consideration, it is decided by the Engineer to incorporate a major variation, the planned and physical progress curves shall be revised incorporating the impact of approved variation The curves shall be recalculated and shall be submitted to the Engineer for consideration prior to its use in the monthly progress reports. An other time-phased planned activities shall remain unchanged during this process in order to maintain the integrity of the precedent programmes and most of all Contractual Construction Programme in any event.

(5) Measurement of activity progress

(a) The actual percentage of the Works completed shall be calculated on a monthly basis as required to support the preparation of the Physical Progress Report. The Contractor shall ensure that sufficient reliable quantitative backup documentation exists to support these calculations for each activity within the Physical Progress Report.

(b) Periodic detailed considerations may be made by the Engineer to assess the Contractor's calculations.

1.8.22 Progress Meetings and Programme Updates

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

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

(3) On a monthly basis, the Contractor shall arrange for its Project Manager, Superintendent, and Scheduler to meet at the Site with the Engineer to review Contractor's Monthly Programme Update. A turnaround document as per the agreed computer software generated by the Contractor will be marked-up to show the agreed upon progress, signed by the Contractor, and a signed copy issued to the Engineer. The Monthly Programme Update shall show up-to-date and accurate progress of the Work, and shall forecast the completion date for activities in progress based on the Contractual Construction Programme. The Monthly Programme Update shall be prepared by the Contractor in co-ordination with all its principal subcontractors and suppliers and the Other Contractors if necessary.

(4) The Monthly Programme Update shall include actual activity data for progress to date, but in the monthly programme update, the Contractor shall not change the schedule logic, the activity relationships/dependencies, or planned activity durations and shall

not add or delete activities. If the Contractor believes that any of these items should be changed, then a proposed revised Works Programme shall be submitted by the Contractor to the Engineer. Although activities shall not be added or deleted in the monthly programme update, activities that have been recommended and approved by the Engineer shall be included in the next monthly programme update.

(5) The Contractor will be notified by the Engineer, in writing, as to acceptance, reasons for rejection, or any revisions required to the Programme. Changes to the programme agreed upon by the Contractor and the Engineer and consented by the Employer shall be incorporated by the Contractor into the programme within seven (7) calendar days after such agreement. Changes on which the Contractor and the Engineer cannot agree shall be documented and shall be subject to the final decision of the Employer and which shall be binding.

(6) Contractor shall adjust the data date ("as of date") to be the same as the end date for the invoicing period.

(7) The monthly programme update shall show actual activity commencement and completion dates, the actual remaining duration in workdays and physical percent complete for those activities commenced and not complete. For the stored materials, the update shall show the amount of material stored, representing the total cost of the materials delivered and properly stored. The monthly programme update shall also show a graphic comparison of the current status and the Work Programme for each activity in the network.

(8) Each monthly programme update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.

(9) Monthly programme updates shall also contain the following information for each activity:

(a) Activity identification number, description and estimated original duration in workdays;

(b) Calculated early and late finish dates;

(c) Actual start and actual finish dates, and remaining duration, in calendar, for those activities started and not completed;

(d) Days ahead and/or behind schedule of the milestones representing the identified contracted milestones and especially to the co-ordination dates. specified contract milestones and contract completion dates;

(e) Physical percent complete for each activity;

(f) A float analysis of the longest path through the Programme detailing potential delays and areas for acceleration. Actual start and finish dates shall be indicated for each activity as appropriate. Completed activities will be omitted from remaining float and late start sorts.

(10) The deliberation of all meetings shall be recorded in the jointly signed Minutes of Meeting.

(11) other Programme Meetings

(a) The Engineer may convene routine and/or ad-hoc review meetings.

(b) Requirement of the meetings will be provided by the Engineer

1.8.23 **Revised Programme**

(1) If at any time the Engineer believes that the current works programme or monthly programme update no longer represents the actual or planned execution and progress of the work, the Engineer may require of the Contractor, and (weather or not being required) the Contractor shall submit a revision to the current Works Programme within seven (7) days after the Engineer's instructions if it is required by him or in the Contractor's opinion.

a) The programme revision, shall be carried out by the Contractor by modifications made to activities and / or activities duration, modification in logic connections between activities with supporting report describing additional resource loading (e.g. labour, equipment, material etc.) and / or the revised construction method / sequence to the current Works Programme or other sub-programmes at the risk and cost of the Contractor

(2) Any proposed revisions to the Works Programme and other sub-programmes shall be submitted to the Engineer for approval with the supporting reports as stated above. This submittal shall include, at a minimum, a written narrative with a full description and reasons for each Work activity revised, a full programme printout of Contractual Construction Programme, and an electronic copy of the revised Works Programme (and / or the sub-programme). For revisions affecting the sequence of Work, the Contractor shall provide a programme diagram "fragnet" which compares the original sequence to the revised sequence of the Work. This diagram shall maintain all the Co-ordination Dates and comply with the Contractual Construction Programme.

1.8.24 **Recovery Programme**

(1) Should the updated Works Programme, the sub-programmes or Monthly Programme Update, at any time during Contractor's performance, show that the Contractor is ten (10) or more calendar days behind schedule for the forthcoming Co-ordination Date and any other identified events on the Contractual Construction Programme, the Contractor shall prepare a Recovery Programme separate from the updated Monthly Programme Update at no additional cost to the Employer (unless the Employer is responsible for the event or occurrence which has caused the programme slippage) explaining and displaying how the Contractor shall reschedule its Work in order to regain compliance with the Contractual Construction Programme.

(2) If a Recovery Programme is required as detailed above, the Contractor shall prepare and submit to the Engineer the Recovery Programme, incorporating the best available information from the Subcontractors, Other Contractors and the Interfacing parties, which will permit the forecasted completion dates to return to the designated Co-ordination Dates and other identified events on the Contractual Construction Programme. The Contractor shall prepare a Recovery Programme to the same level of detail as the originally accepted Works Programme / sub-programme / Monthly Programme.

(3) The Contractor shall discuss and finalize the Recovery Programme, as prepared by him, with the Engineer and finalized for his acceptance within 7 working days of its initial submission by the Contractor. . The Recovery Programme, once accepted by the Engineer, shall be implemented as the Revised Works Programme / sub-programme / Monthly Programme as the case may be for the remaining Works in the scope.

1.9 PROJECT CALENDAR

1.9.1 The project weeks shall be commenced on a Monday. A day shall be deemed to commence at 0001 hour on the morning of the day in question. Where reference is made to the completion of an activity or milestone by a particular week, this shall mean by midnight on the Sunday of that week.

1.9.2 A 7-day week calendar shall be adopted for various (Works) programme schedules for scheduling purposes.

1.9.3 Basic Work Unit shall be "days" for scheduling purposes.

1.9.4 The presentation shall be in 'Week"' units for project purposes.

1.9.5 The Contractor shall develop a detailed programme covering the whole scope of the Contract to be executed within the completion period as specified in the Contract and based on the Bid Program and submit the same to the Engineer for his consent within 28 days after the Commencement Date. Upon consent by the Engineer to the programme, it shall be referred to as the Contractual Construction Programme, and become an integral part of the Contract. The Engineer shall seek the consent of the Employer before communicating the acceptance of the Contractual Construction Programme to the Contractor.

1.9.6 Based on the Contractual Construction Programme, the Contractor shall submit sub-divided and further detailed Works Programmes to the Engineer for checking and monitoring the Works.

1.9.7 The Works Programmes for the all Works Segments as defined in Clause 4.5.16 of Particular Specification [Definition of Work Segments] and sub-clause 1.8.10 [Design Submission Programme] of this Employer's Requirements produced and submitted to the Engineer shall be strictly in compliance with the Contractual Construction Programme.

1.9.8 In compiling its Works Programme and in all subsequent updating and reporting, the Contractor shall make provision for the time required for coordinating and completing the design, testing, commissioning and integrated testing of the Works, including inter alia, design co-ordination periods during which the Contractor shall co-ordinate its design with those of Other Contractors, the review procedures, determining and complying with the requirements of all government departments and all others whose consent, permission, authority or license is required prior to the execution of any Work.

1.9.9 The Works Programme shall take full account of the Design Submission Programme.

1.10 Document Submission and Response Procedure

Within 28 days after the Commencement Date, the Contractor shall submit the Document Control Procedure to the Engineer for review, which shall comply with the detailed technical requirements as detailed below.

1.10.1 **CAD and Document Standards :**
Requirements on Documents

Within 60 days after Commencement Date, the Contractor shall submit a Document Control Procedure to the Engineer for review, which shall comply with the detailed technical requirements herein :

(a) Drawing Register

The Contractor shall submit the Engineer a CAD and document management system with a drawing register procedure as part of the Document Control Procedure in electronic copy and hard copy, with which he shall submit each submission of drawings and update at an interval agreed by the Engineer.

The drawing register shall be in a format submitted in the CAD and Document Management System for review and agreed without objection by the Engineer and shall include each document reference number, version, date, title and data-file name.

(b) Records and Reports

All Reports and records shall be submitted via Project Management Information System to the Engineer and shall be in a format agreed by the Engineer as outlined below. One hard copy of all the reports and records duly signed by the Contractor shall also be submitted to the Engineer.

(1) Cover Format (Arial)

(a) Heading and name of client are on top, in capital, size 10.

(b) Name of the project is in bold letter, size 24.

(c) Content of document is in bold capital, size 18.

(d) Documents' reference number is in bold capital, size 14

(e) Company name: capital, size 14.

(f) Company's logo is in size 35x40 (WxH) mm.

(g) Address of the company is in normal letter, size 10.

(2) Document Format (Arial) : General regulations

(a) Height of letter: applied size 10.

(b) Paper size A4 (A3 is used for table.)

(c) Periods, semicolons, etc. should be put right after the letter.

(d) The space between paragraphs and headings is 1 line.

(e) Main headings: are placed in number's order and the period is right after the heading, then a space, written in bold capital letters. For ex.: **1. IN BOLD CAPITAL:**

(f) other headings: are placed in number's order and the period is right after the heading, then a space, written in bold normal letters. For ex.: **1. In bold normal letter:**

(3) Note

(a) Notes of tables should be included in the table; in case if they are not able to be included, they should be noted clearly that they are notes for which table.

(b) Notes are usually in italic letters.

(4) Contents of the documents

(a) Following the Indian regulations, standards of technical process on survey, design, experiment, etc.

(5) Document Numbering System

The Contractor shall prepare the document numbering system and describe it in the Document Control Procedure.

(6) Units

The Contract shall utilize the SI system of units.

1.10.2 Requirements on Drawings

(1) General

(a) The Contractor shall adopt a title block similar for all drawings prepared under the Contract.

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

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

ID - Inception Report Drawing

TD - Technical Design Drawing

CD - Construction Technical Drawing

BD - As-Built Drawing

(2) Drawing Numbering System

(d) The drawing number shall comprise nine (9) letters/digits plus a revision letter in the following format:

Drawing No.	Revision
n / xx / xx / nnnn	x
(A) (B) (C) (D)	(E)

(Note: This format permits the use of a full 10 - character computer reference, combining the Drawing No. and Revision.)

(e) (A) - A single digit (from 1 to 7) denoting the Contract Package Number of project e.g.

1 - CT P-1 Civil/Building/Track Works Rewari – Ajmer Section;

2 - CT P-2 Civil/Building/Track Works Ajmer –Ikbalgarh Section;

3 - CT P-3 Civil/Building/Track Works Ikbalgarh – Vadodara Section;

4 - CT P-3A Special Steel Bridges across rivers Mahi and Sabarmati

5 - EM P-4 Traction Power and Supervisory Control & Data Acquisition System

6 - CT P-5 Signal & Telecommunication;

7 - CT P-6 Plant and Equipment for operation and Maintenance; and

8 - CT P-7 Electric Locomotive and Maintenance Depot.

(f) (B) - A two (2) letter code denoting the subjected area e.g.

TP Traction Power

OH Traction Overhead Equipment

SC SCADA

= In case of any other drawings, the drawing numbering system shall be submitted by the Contractor to the Engineer for his consent

(3) Drawing Size

The drawings produced by the Contractor for submission to the Engineer / Employer shall generally be to ISO A1 size unless otherwise instructed by the Engineer. They shall display the title block containing the information / details as specified here in and shall be got approved from the Engineer in advance

1.10.3 **CAD Standards : Introduction**

The main objectives of the CAD standards are as follows:

(1) To ensure that the CAD data files produced for project are coordinated and referenced in a consistent manner.

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

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

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

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

1.10.4 CAD Data Creation, Content & Presentation

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

(1) Model Space Files

(a) Typically CAD "Model Space" files shall be required for general arrangement and location plans and will consist of a series of other "Model Space" referenced CAD files covering the total design extents at a defined building level (the number of referenced files shall be kept to an absolute minimum). Data contained within a CAD "Model Space" files shall be drawn at full size (1:1) and located at the correct global position and orientation on the Project Grid / or defined reference points.

(b) Each CAD "Model Space" file will relate to an individual discipline. Drawing border / text, match / section lines or detailed notation shall NOT be included within a CAD "Model Space" file. Dimensions shall be included within a CAD "Model Space" but located on a dedicated layer. Elevations, Long Sections and Cross Sections shall also be presented in CAD "Model Space" as defined above, but do not need to be positioned and orientated on the Project Grid.

(2) Paper Space CAD Files

(a) "Paper Space" CAD files shall be utilized to aid the process of plotting "Paper" drawings and shall be primarily a window of the CAD "Model Space" file. A "Paper Space" CAD file shall typically contain drawing borders, text, match or section lines & detailed notation. Once these files are initially set up and positioned the majority of "Paper Drawing" plots at various approved scales are efficiently and consistently generated by displaying different combinations of element layers and symbology contained within the "Paper Space" file and the referenced "Model Space" files.

(b) The purpose shall be to ensure that total coordination is achieved between the CAD "Model Space" file and the "Paper Drawing" output during the revision cycle of the design and production process. Duplicated data in "Model and Paper Space" files shall not be acceptable unless an automatic update link exists between the two data sets. "Paper Space" files shall not typically be required as part of the CAD Media Receipt from contractors, unless specifically requested.

1.10.5 CAD Quality Control Checks

(1) Random CAD Quality Control Audits will be carried out by the Engineer on all CAD media received and transmitted.

(2) These checks DO NOT verify the technical content of the CAD data received or transmitted (as this is the responsibility of the originating organization), however compliance with CAD and drafting standards shall be checked.

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

1.10.6 Revisions

(1) All Construction Industry symbols produced as CAD Cells shall typically conform to Indian regulation.

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

1.10.7 Block Libraries, Blocks, & Block Names

(1) All Construction Industry symbols produced as CAD Cells shall typically conform to Indian regulation.

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

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

(4) All Blocks of a common type, symbols or details shall initially be created within a CAD "Model Space File" specifically utilized for that purpose. These files shall be made available to the Engineer / Employer as required.

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

1.10.8 CAD Dimensioning

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

1.10.9 CAD Layering

All CAD elements shall be placed on the layers allocated for each different engineering disciplines in coordination and interface with the Other Contractors. The layer naming convention and numbering to be adopted by the Contractor as well as Other Contractors shall be proposed to the Engineer for acceptance and inclusion within these standards.

1.10.10 Global origin, Location and Orientation on the Alignment Drawing

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

(2) Location plans shall have at least three setting out points shown on each CAD "Model Space" file. Each setting out point shall be indicated by a simple cross-hair together with related to Eastings and Northings co-ordinates. The Contractor shall establish the setting out coordinates for his respective Works, which will then be used by the Other Contractors.

1.10.11 Line Thickness and Color

To facilitate the consistent plotting by the Contractor and other users, the colour codes, line shape, line thickness / pen sizes etc. for different applications of the works / work elements shall be assigned by the Contractor and submitted to the Engineer for his consent.

1.10.12 Master List of Documents for Approval

The Contractor shall furnish the Engineer a master list of the technical documents for approval, which he proposes to prepare and submit under the Contract, within 60 days from the Commencement Date. The master list shall include the drawing number, title and the Contractor's target date for the first submission of each document for approval.

The master list of documents to be submitted shall be subject to the Engineer's approval.

The master list shall be used to monitor submission and approval of each drawing.

1.10.13 CAD Utilization of 2D & 3D Files

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

1.10.14 CAD File Numbering

(1) Contractor's CAD File Numbering shall be as described in clause 2.2 above.

(2) Employer's CAD File Numbering : This will follow the numbering system as specified above except that the status of the drawing shall be with the letter "E".

1.10.15 CAD File Naming Convention – General

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

1.10.16 Submission, Receipt and Transmittal of Documents and Drawings

Submission of the Documents and Drawings

Unless and otherwise instructed by the Engineer, when the Contractor submit any documents and drawings to the Engineer for his check/ review/ approval/ consent/ issue of "Notice of No Objection" as well as in respect of "Good for Construction Drawings" and "As Built Documents", the Contractor shall prepare six (6) sets of hard copies (controlled copies) with one (1) set of CDs of submitting documents and CAD data of submitting drawings.

1.10.17 Data Transfer Media and Format

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

(1) Data Exchange Format

  (a) Document including tables and figures: PDF (.pdf)

  (b) Drawings: Autocad Vr. 2011 (.dwg)

(2) Operating System - Windows XP/VISTA
(3) Data Transfer Media : 12cm Compact Disc (650 MB) is highly preferred
(4) All CDs or tapes shall be labeled on the data shield with:

  (a) Name of Company / Contractor

  (b) Project Title

  (c) Drawing Filenames

(5) The Contractor shall ensure the supplied media is free from virus.

1.10.18 **CAD Media Receipt & Transmittal**

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

(a) CAD Digital Media shall typically contain CAD "Model Space" and "Paper Space" files;

(b) CAD data sheet;

(c) CAD issue/ revision sheet; and

(d) CAD Quality Checklist confirming compliance.

(2) The above CAD media will be collectively known as "CAD Media Transmittal Set". The CAD data file transmittal format required by the Engineer from all contractors shall be in AutoCAD (version 2011)

(3) All CAD media received from contractors will be retained by the Engineer as an audit trail / archive of a specific contractor's design evolution.

(4) CAD Media Receipt (from the Engineer to the Contractor)

(a) CAD media should normally be as obtained from the respective Other Contractors and Interfacing parties , but should the Engineer issue CAD media it will consist of the following:

(i) CAD Digital Media typically contain only CAD "Model Space" files.

(ii) CAD data sheet.

(iii) CAD issue / revision sheet

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

1.10.19 Within 28 days after commencement date, the Contractor shall submit the Document Control Procedure to the Engineer for review, which shall include but not be limited to the following:

(1) a document approval system which shall specify the level of authority for approval of all documents before submission to the Engineer and in accordance with the requirements as specified in Clause 1.11 of [Quality Assurance] Employer's Requirements – General Specification.

(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

(a) contract number;

(b) discipline;

(c) submission reference number; and

(d) revision indicator.

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

1.10.21 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 records.

1.10.22 Submission and Response Procedure

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

(2) Each submission shall be accompanied by a brief introduction to explain which subsystem - part 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.

(3) 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 above, the submission title, the stage of submission (e.g. Inception Report, Technical Design, etc.), and the signature of the Contractor's Representative to confirm that, in the opinion of the Contractor, the submission:

a) complies with all relevant requirements of the Employer's Requirements;

b) conforms to all interface requirements;

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

d) has been properly reviewed by the Contractor, according to the Contractor's Project Quality Assurance Plan, to confirm its completeness, accuracy, adequacy and validity;

e) has taken account of all requirements for approval by statutory bodies or similar organizations, and that where required, such approvals have been granted; and

f) contains six (6) properly signed copies of the "Design Certificate", if necessary, as required in Clause 1.11 [Quality Assurance] of and Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements – Particular Specification.

g) In case of new products / technologies, certification from the client railway of the organized railway system certifying its established and proven record under similar atmospheric and operational conditions as specified in Chapter 19 of this Employer's Requirements.

(4) The Engineer's response to the submission will be made within 21 calendar days of receipt of the submission,

(5) Throughout the 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 four 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. Unless otherwise directed by the Engineer, all meetings shall be convened in Engineer's Office or Contractor's Main Office or at the Site Office or at any other location as decided by the Engineer.

(6) 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.

(7) 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 5 days

advance notice, and the Contractor shall attend at the time and place appointed by the Engineer.

(8) In case of use of new products / technologies (other than RDSO design), requiring evaluation and validation of RDSO (as specified in Chapter 19 of this Employer's Requirements, the Engineer's response to the submissions by the Contractor will be made within 90 days from the date of submission of complete relevant data / certification by the Contractor

1.10.23 Engineer's Response

(1) The Engineer shall respond in one of the following three ways:

a) Notice of No Objection

b) Notice of Objection (With "A" Comments)

c) Notice of No Objection with Comments

(2) Definition of Engineer's response:

a) "Notice of No Objection": if following his review of the submission, the Engineer has not discovered any non-compliance with the Contract, the Engineer shall 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.

b) "Notice of Objection (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 Objection" (NOO) with type "A" comments. The Contractor shall revise and reissue the submission addressing the Engineer's comments. Following the issue of a NOO by the Engineer the Contractor is not entitled to proceed to the next programmed stage on the path in the relevant network as previously approved by the Engineer until all of the Engineer's comments have been fully addressed and a NONO is issued.

c) "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 No Objection" (NONOC) with Comments. The Contractor shall respond to the comments, agreed and incorporated prior to inclusion in the "Construction Package Following the issue of a NONOC 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.

1.10.24 Documents requiring consent of the Employer before according 'No Objection" by the Engineer

1 General Traction Power Supply Diagram and Sectioning Diagram.
2 Final Design of the Protection Scheme.
3 SCADA System including its Communication Protocal
4 Traction Equipment Prototype Tests
5 System EMC Control and Management Plan.
6 Earthing & Bonding Management Plan demonstrating safety of the System and that of the installation in vicinity
7 Power quality issues and its implementation
8 Designs of Components to be used on the OHE if other than those

already approved by RDSO.

9. The Design Manual

1.10.25 Requirements for Submission of Documents and Drawings

a) Major submittals which the Contractor shall make to the Engineer for consent are summarized in the Table 1.10-1 [Programme Submissions]. and Design Submittals. The details of the five major Design Submittals are included in Chapter 3 Design Requirements and its conceptual flow diagram shown in para 3.1.13,. The submissions as indicated here are not exhaustive and shall be supplemented for meeting the Contract requirements and as instructed by the Engineer.

b) The Table shows all the Works Programmes (as specified in Clause 1.8 of this Employer's Requirement) to be submitted to the Engineer for consent at the timing as specified therein.

Table – 1.10-1 Programme Submissions

S.No.	Programme	Initial Submission	Update Interval
1	Contractual Construction Programme	Within 28 days after Commencement Date	The timing as described in General Conditions, Clause 8.6
Works Programme:			
2	Survey Plan and Programme for Validation of Data Provided by Engineer and Additional Surveys and Geotechnical investigations as required by the Contractor, if considered, necessary.	Within 28 days after Commencement Date	Not more than one (1) month and as the Engineer instructs
3	Basic Design Submission Programme (a) Inception Report (b) Traction simulation (c) Basic Designs	Within 42 days after Commencement Date	- do -
4.	Construction Programme detailed into (a) Programme for OHE (b) Programme for supply control posts (c) Programme for Traction Sub-station (d) Programme for SCADA	Within 42 days after Commencement Date	- do -

S.No.	Programme	Initial Submission	Update Interval
5.	Coordinated Construction Programme	3 months before start of construction work activities	- do -
6.	Temporary Facilities and Utility Services Programme (Ref. clause no. 2 of Clause 4.3 of G.S. and clause 10.3 of Appendix	Within 42 days after Commencement Date	- do -
7.	Procurement and Commissioning Programme Ref. Clause no. 11.1 of Appendix 5	Within 84 days after Commencement Date	- do -

NOTE : Coordination Events & Key Milestones (ATB-8.2) for Contracts CTP-1 & CTP-2 and CTP-3) are given in table 'Time of Completion in Vol. I of the Bid Document. Coordination dates and No. of weeks (W & D) refer to commencement dates of these Particular Contracts.

1.11 Quality Assurance Requirement

1.11.1 **General**

(1) The Contractor shall maintain and implement a quality management system that shall remain in effect during the execution of the Works. The Contractor's quality management system shall be tailored specifically to the Contract and the Works in accordance with ISO 9001 – Quality Management System, the latest edition of the International Standard ISO 9001, and shall submit his quality management system titled as the Project Quality Assurance Plan for Engineer's review as specified herein.

(2) The Project Quality Assurance Plan documentation shall include, but shall not be limited to the following:

(a) Project Quality Assurance Plan (as Contractor's integrated quality assurance documentation);

(b) Design Quality Assurance Plan;

(c) Site Quality Assurance Plan (as including Inspection and Test Plan);

(d) Manufacturing Quality Assurance Plans (as including Inspection and Test Plan); and

(e) On-site Inspection Plan for Resources Procurement;

(3) The Contractor shall plan, perform and record all quality control activities to ensure that all Works are performed in accordance with the requirements under the Contract and are detailed in the quality plans, which are required herein. Such activities shall include, without limitation, the inspections and/or test expressly or implicitly required by the Contract.

(4) Quality audits will be carried out by the Engineer and surveillance audit shall be carried out by Employer to verify the Contractor's implementation and compliance with the quality management system as specified herein.

1.11.2 **Submission of Quality Documentation**

(1) Quality system documents to be submitted shall embrace all activities of the Contractor and his Sub-Contractors of any tier, including his suppliers and any design consultants for the execution of the Works.

(2) Within 42 days after the Commencement Date, the Contractor shall submit the following documents for review by the Engineer:

(a) Contractor's Quality Assurance Philosophy

(b) Project Quality Assurance Plan; and

(c) Design Quality Assurance Plan and any associated work instruction and/or standard forms which the Contractor proposes to be used for the Contract.

(3) The Contractor shall submit the separate Site Quality Assurance Plan and Manufacturing Quality Assurance Plans for managing, controlling and recording the on-site construction and manufacturing process including off-site process for individual key items of the Works. The Manufacturing Quality Assurance Plan shall be submitted for review by the Engineer for his consent as part of Technical Design development as described in Clause 5 of this Employer's Requirements.

(4) The Contractor shall submit the separate On-site Inspection Plan for Resources Procurement for managing, monitoring and recording the on-site receipt of general construction resources including all construction materials, labour forces, and works and services delivered to the construction site. The On-site Inspection Plan for Resources Procurement shall be submitted for consent by the Engineer as part of Technical Design development as summarized in Clause 3.7 of [Requirements for Submission of Documents and Drawings] Employer's Requirements -- Particular Specification.

(5) The Contractor shall, and/or as requested by the Engineer, continuously review and update the quality system documents to meet the requirements and development of the Works throughout the duration of the Contract. For any amendment to the quality system documents, the Contractor shall prepare and submit the proposed amendment for consent of the Engineer.

(6) The Plan shall clearly define the Contractor's policy, Quality Assurance Organization, Management responsibility, the requirements for Quality Assurance personnel, their qualifications, skills and training, the Contractor's Quality Audit schedule.

(7) Records of certifications shall be maintained and monitored by the Quality Assurance personnel. These records shall be made available to the Engineer / Employer for inspection and review as and when required.

(8) The Quality Assurance operations shall be subject to the Engineer's / Employer's verification at any time.

(9) The verification will include: surveillance of the operations to determine that practices, methods and procedures of the plan are being properly applied; inspection to measure quality of items to be offered for acceptance; and audits to ensure compliance with the Contract documents.

(10) The Contractor's Quality Audit schedule shall be submitted to the Engineer for consent every three months or more frequently as required.

(11) The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer / Employer to carry out on-site and off-site Quality Audit / surveillance audit to verify that the Contractor's quality assurance system which has been consented by the Engineer, is being implemented fully and properly.

1.11.3 **Controlled Copy of Quality System Documentation**

The Contractor shall promptly supply the Engineer with six (6) controlled copies of his quality system documents duly consented by the Engineer. The Contractor shall maintain such controlled documents throughout the duration of the Contract. In addition, the Engineer may request further copies of the quality system documents and these documents shall reach to the Engineer office within fourteen (14) days of notification.

1.11.4 **Project Quality Assurance Plan**

The Project Quality Assurance Plan shall establish the Contractor's management structure which functions efficiently to execute the Works in compliance with the Employer's Requirements under the Contract and shall, without limitation, define as follows:

(1) A dedicated Quality Assurance Team

(2) Appointment of a Chief Design Engineer and a Quality Assurance Engineer as described hereinafter;

(3) A set of organization charts which depict in line with the Contractor's intent of the quality plans. Each organization chart shall identify the Contractor's managerial staff with reference to any member of the partnership, consortium or joint venture, and the main Sub-Contractors and indicate the reporting structure and the interface relationship between all parties involved;

(4) Each organization chart which may be subdivided with regard to Works segments, site locations, and phases and stages of the project to ensure complete implementation of the quality management system in every part to the Work.

(5) The Allocation of responsibilities and authorities given to managerial and technical staff with particular reference to the design and site supervision of the Works; and

(6) Hierarchy of the quality management system documentation for managing and controlling the whole system.

1.11.5 The Contractor shall submit the Curriculum Vitae (CV) of each member of his Quality Assurance Team and other personnel relevant to his quality management system. Assignment of such personnel shall be subject to prior consent of the Engineer,

1.11.6 The Project Quality Assurance Plan shall without limitation include Quality Assurance procedures for design, construction, manufacturing, supply, installation, testing and commissioning and shall contain control processes for each stage in the Work such as design verification and validation, management of change control, non-conformance procedures, control on sub-standard practices, inspection, testing, auditing and so on.

1.11.7 The Project Quality Assurance Plan shall also include a full list of quality management procedures, method statements, inspection and test plans, standards and protocol and/or standard forms, which shall form the frame work of the Project Quality Assurance Plan. It shall define specific procedures to perform the quality management activities and to record the evidence of the activities performed and/or the results achieved. It shall detail the system and the procedure by which the Contractor shall ensure that :

- The Quality Assurance Plan is fully observed at all times and
- Any non-compliant and sub-standard material, practice and / or work are brought back to compliance

1.11.8 It shall cover the requirements of the International Standard ISO 9001 in compliance with the Contract as precedence requirements, and shall, without limitation, include the basic management disciplines as follows:

(1) Review, approval and updating management of the quality system documents to ensure their continuing suitability and effectiveness;

(2) Design control management to all Permanent Works and/or Temporary Works, including design works carried out by Sub-Contractors and sub-consultants. The procedures shall clearly define the review and verification procedures of the designs submittals and the design packages described under the Contract.;

(3) Drawing management in the Contractor's main office and site office(s), including procedures of production, approval, updating, maintaining, storage and distribution;

(4) Document management, including procedures of registration, updating, indexing, filing, maintenance, storage and distribution and monitoring and recording of the submission and re-submission to the Engineer;

(5) Monitoring, recording and control of the quality system of his Sub-Contractors with respect to their quality of works with relevant time schedule; and

(6) Quality control of the Works including Quality audits to be held on the Contractor and Sub-Contractors, suppliers and design consultants of any tiers.

1.11.9 Design Quality Assurance Plan

The Contractor shall prepare the Design Quality Assurance Plan separately for its design Works. The Design Quality Assurance Plan shall establish the Contractor's policy for the design works in compliance with the Employer's Requirements under the Contract and shall, without limitation, define as follows:

(1) Organization of the Contractor's Design Team in context with the Contractor's entire organization so as that it functions appropriately in this Design-Build Lump Sum Contract;

(2) Allocation of responsibilities and authorities to be given to the Design Team, to the individual identified design staff and the Subcontractors for particular design works. Especially the Internal Authorization Process as detailed herein below and Employer's Requirements – Design shall be focused on in this respect.

(3) Hierarchy of relevant documentation (including drawings) of quality management system for managing and controlling design works, including design works of Subcontractors of any tier to avoid conflicts in the design submissions; and

(4) A list of general procedures to be applied to manage and control the quality of the design works.

(5) The Functional procedures which maintains the Design Team in whole Contractor's organization to carry out the design works strictly in compliance with the Employer's Requirements and for the benefit of the Employer.

1.11.10 Site Quality Plan
On-site Quality Management Provisions

The Contractor shall prepare a Site Quality Plan separately for the construction and installation of Works. The Site Quality Plan shall include the comprehensive on-site quality management in compliance with the Employer's Requirements under the Contract and shall, without limitation, define as follows:

(1) Organization of the Contractor's staff directly responsible for the day-to-day management of the construction and installation activities to execute the Works on the site;

(2) Allocation of responsibilities and authorities given to identified personnel or Subcontractors for particular construction and installation of the Works;

(3) Hierarchy of relevant documentation (including drawings) of quality management system for managing and controlling construction and installation of the Works,

including construction and installation works of Subcontractors of any tiers to avoid conflicts in the execution of the Works; and

(4) A list of sequences to be applied to manage, control and record the construction and installation of the Works.

1.11.11 On-site inspection and test provisions

(1) The Contractor shall note that he shall also prepare on site inspection and test plans to manage, control and record any test and inspection activities. The Inspection and Test Plans shall be established for particular activities which require inspection and/or test to meet the quality level required in the Employer's Requirements and as included in any form in the Contractor's design and the Works Specification. It shall cover the requirements of International Standards ISO 9001 and in compliance with the Contract

(2) The Contractor shall prepare and maintain a full list of the all Inspection and Test Plans needed under the Contract with submission status and review status, and shall submit to the Engineer for his consent.

(3) Each Inspection and Test Plan for the particular activity shall define, without limitation:

(a) Scope of activities covered by the plan;

(b) A sequence of the Work related to the activities in the scope;

(c) Personnel responsible for undertaking the inspections and/or tests and the personnel responsible for certifying the inspections and tests;

(d) Inspections and/or test methods, their frequency, and/or reference materials to the relevant standard of the inspections and/or the tests;

(e) Compliance criteria of the inspections and/or tests with clear descriptions of the quality hold point and the quality control point;

(f) Documents to be used for reporting the results of the inspections and/or tests with sample documents incorporated into the Plan; and

(g) Methods of record keeping and document storage as to the locations to be maintained / stored and procedures for those to be acknowledged / filed.

1.11.12 Manufacturing Management and Quality Assurance Plans
Manufacturing Quality Management Provisions

(1) The Manufacturing Quality Plans shall define the Contractor's management structure and quality management system for the manufacturing process of the key items of the Works, and for the items as requested by the Engineer. Separate Manufacturing Quality Assurance Plans shall be prepared for each manufactured item and submit them to the Engineer for consent.

(2) Each Manufacturing Quality Assurance Plans for manufacturing process management shall be established in compliance with the Employer's Requirements under the Contract and shall, without limitation, define as follows:

(3) Scope of activities and items covered by the plan;

(4) Organization of the Contractor and/or the Subcontractor responsible for the day to day management of the manufacturing process of the items;

(5) Allocation of responsibility and authority given to identified personnel for the day to day management of the manufacturing process with particular reference to the supervision, inspection and testing of the process and manufactured items;

(6) Specific methods including handling and management of the manufacturing process and manufactured items, including but not limited to the following:

(a) Particulars of the materials to be used in the manufacturing process;

(b) Monitoring and management of manufacturing process in compliance with the approved drawings and specifications;

(c) Identification or referencing procedures for traceability of the manufactured items;

(d) Identification of the inspection and test status of the materials and the final manufactured item;

(e) Disposition of nonconforming materials and the manufactured item;

(f) Handling, storage, packaging, preservation and delivery of the manufactured item; and

(g) Procedure of monitoring and recording of the ordering and delivery of the item.

1.11.13 **Manufacturing inspection and test provisions**

(1) The manufacturing inspection and test plans to be prepared by the Contractor shall cover all the requirements of Tests: Type Tests(wherever applicable), Factory Acceptance Tests, site checks and tests, Installation Tests, Partial Acceptance tests, functional tests, system acceptance tests and tests on completion as required.

(2) In addition to the inspection by the Contractor and the Engineer, the Employer may, at its own cost, depute its representative or nominate any other independent inspection agency for supervising, monitoring and inspection of raw materials and manufacturing process at the factory. To facilitate such an inspection, the detailed production/manufacturing plan shall be provided by the Contractor to the participants of the inspection as well as to the Engineer / Employer at least six weeks in advance of the commencement of the manufacturing process along with the description of mandatory specifications and tests proposed during the manufacturing process and the tests intended to be conducted on the finished product along with codal permitted tolerances.

1.11.14 **On-site Inspection Plan for Resources Procurement**

(1) The Contractor shall establish On-site Inspection Plan for Resources Procurement for managing, monitoring and recording the on-site receipt of general construction resources including all construction materials, labour forces, and works and services delivered to the Site and the Temporary Facilities e.g. assembly and tests on assemblies prior to installation, their stacking and storage etc. in the Work Areas.

(2) On site Inspection Plan for resources procurement to be prepared by the Contractor shall cover all the requirements as described in sub-clause 1.11.11 above.

1.11.15 **Design Review Procedure**
Contractor's Design Team

(1) The Contractor shall be responsible for the design of the Works and shall ensure his design is correct / accurate and in compliance with the Employer's Requirements and Specifications contained in the Contract. The Contractor shall also be responsible for the construction, installation, testing and commissioning of the Works and shall ensure that all the completed Works are in line with his design and concurrently in compliance with the Employer's Requirements and Specifications in the Contract and safe.

(2) The Contractor shall establish his dedicated design team referred to as the Design Team in his organization to ensure that his design works are strictly in compliance

with the Employer's Requirements and Specifications and for the benefit of the Employer. On the other hand, to clarify the responsibilities and the authorities, the Contractor shall also establish a Construction Team independent of the Design Team. Thereby the Contractor is responsible for assuring the quality of the Works as required in the Employer's Requirements and Specifications in the Contract.

1.11.16 **Chief Design Engineer**

(1) The Contractor shall appoint a fully qualified and experienced full-time Chief Design Engineer, whose credentials has been submitted by the Contractor in the Form PER-2 "Resume of Proposed Personnel as contained in Volume-1 of the Bid Documents as part of his Technical proposal and has been accepted by the Employer. The Chief Design Engineer shall act as a representative of Design Team and shall be wholly responsible for the Contractor's design Works.

(2) The Chief Design Engineer is responsible for establishing, implementing, maintaining and recording Design Quality Assurance Plan.

(3) The Chief Design Engineer shall be able to discharge his duties without any hindrance or constraint. Accordingly, the Chief Design Engineer and his team shall strictly adhere to ISO 9001 – Quality Assurance System of the Contractor's company or of the Lead Member of the Consortium or JV, as consented by the Engineer so as to ensure that his decisions and activities with regard to the Quality Assurance be checked and monitored by the internationally acknowledged system. The Contractor shall identify the personnel to whom the Chief Design Engineer shall be responsible and reports to and seek the consent of the Engineer for the same. The Contractor shall also identify personnel necessary under the supervision of the Chief Design Engineer to furnish the Design Team to fully function as intended in the requirements herein and seek the consent of the Engineer. In addition, the Contractor shall make available any such resources that are necessary to ensure the effective implementation of the quality management system.

(4) The Contractor shall submit details of the authority and responsibility of the proposed Chief Design Engineer for review and consent by the Engineer, as part of the Project Quality Assurance Plan.

1.11.17 **Internal Authorization Process**

(1) All design submissions including Technical Design, Construction Design, As-Built Documents shall include a valid "Design Certificate" (as set out as Attachment QA-1) duly signed by the individual who actually does the design in case the Contractor himself is the designer or the authorized representative of the any entity engaged by the Contractor in case the Contractor himself is not the designer (the Designer) , Chief Design Engineer in the Contractor's Design Team and Contractor's Representative, thereby demonstrating that :

(a) Design of the Permanent Works complies with the Employer's Requirements and Specifications and other requirements of the Contract
(b) In-house checks have been undertaken to conform the completeness, adequacy and validity of the design as per all the quality assurance procedures
(c) All the required approvals has been obtained
(d) Design has been performed and finalized utilizing the skills of a professionally qualified, competent and experienced designers and Engineers

(2) The Contractor shall fully verify the respective design outputs as a set of submissions through the Internal Authorization Process by signing and attaching "Design Certificate" as the covering document. Forms, further details and other requirements of the contents of the respective Design Package are given in Clause 4.4 of [Basic

Design Philosophy and Requirements for Design] Employer's Requirements -- Particular Specification and sub-clause 1.8.10 of this Employer's Requirements.

(3) After receiving the "Notice of No Objection' or "Notice of No Objection with Comments" in respect of the Construction Design, all the original paper drawings in respect of Working Drawings shall be endorsed as "Good For Construction" by Chief Design Engineer before issuing it to the Site or submitting to the Engineer for his endorsement as specified in Employer's Requirements – Design.

(4) In case the Contractor contemplates any change in the design already submitted to the Engineer for approval and / or for the design and drawings for which the Contractor has already received 'Notice Of No Objection', it shall be dealt as per the provisions of Design Review Procedure as detailed above and in Employer's Requirements – Design and 'Design Changes and Variation Procedure' as detailed in Clause 4.4 of [Basic Design Philosophy and Requirements for Design] Employer's Requirements -- Particular Specification and clause 1.8.10 of [Design Submission Programme] to this Employer's Requirements

(5) ISO 9001 (Design-Build) shall be applied to the Internal Authorization Process by being tailored specifically to the Contract.

1.11.18 **Tests**

(1) Tests to be carried out for quality assurance purposes shall be as specified in the Specifications (Volume III of the Bid Documents) and as per the Quality Assurance Plan / Inspections and Test Procedures duly approved by the Engineer based on the relevant Codes and as specified in Volume III: Particular Requirements – Particular Specifications.

(2) The Contractor may employ other tests to further ensure the quality of the Works. In such a case, the Contractor is responsible for obtaining prior approval from the Engineer by submitting the test plans with regard to the application of the tests as part of the Project Quality Assurance Plan or its sub-plans.

1.11.19 **Quality Audits**

(1) The Contractor shall carry out quality audits on the Works at quarterly intervals, or at such other intervals as the Engineer may require, to ensure the continuing suitability and effectiveness of the quality management system. Reports of each such audit shall be submitted promptly to the Engineer for review.

(2) The Contractor shall submit for review by the Engineer details of the authority, qualifications and experience of personnel assigned to quality audit activities before carrying out quality audits.

(3) The Engineer may require quality audits on the Contractor and his Subcontractors of any tier to be carried out by his representative or the Employer's staff. In such case, the Contractor shall afford to such auditors all necessary facilities and access to the activities and records to permit this function to be performed.

(4) Upon receipt of corrective action request (CAR) or similar document issued by the Engineer as a result of quality audits, the Contractor shall promptly investigate the matter and submit the proposed corrective and preventive actions within 14 days to

the Engineer for review. The Contractor shall take timely corrective and preventive actions to rectify the matter and to prevent re-occurrence. Evidence to demonstrate effective implementation of corrective and preventive actions shall be submitted by the Contractor to the Engineer for review.

1.11.20 **Notification of Non-conformities**

(1) If, prior to an issue of the Taking-Over Certificate for the Works or the relevant Section, the Contractor has used or proposes to use or repair any item of the Works which does not conform to the requirements of the Contract, the Contractor shall immediately submit for review by the Engineer of such proposal and supplying full particulars of the nonconformity and, if appropriate, of the proposed means of repair.

(2) If the Engineer issues nonconformity report or similar documents to notify the Contractor of any item of the Works which does not conform to the requirements of the Contract, the Contractor shall promptly investigate the matter and, within 14 days of notification by the Engineer, submit to the Engineer for review the remedial measures and necessary actions to be taken to rectify the item and to prevent re-occurrence.

(3) The Contractor shall maintain and update a nonconformity register to indicate the status of all nonconformities which are identified by the Engineer/ and or the Contractor. The Contractor shall submit the register for review upon request by the Engineer.

1.11.21 **Monthly Progress Report on Quality Management System**

(1) The Contractor shall continuously monitor the performance of the quality management system and shall include the same in each Monthly Progress Report as required in Clause 1.22 of [Monthly Progress Report] of this Employer's Requirements

(2) The Contractor shall provide and maintain at all stages of the Works a quality control register or registers to identify the status of inspections, sampling and testing of the work and all certificates. Such register shall be updated by the Contractor to show all activities in previous months and shall reach the Engineer's office before 7th working day of each month. Each register shall:

(a) List the certificates received for each batch of goods and materials incorporated in the Works and compare this against the certification required by the Contractor and the Contractor's quality plans;

(b) List the inspection and testing activities undertaken by the Contractor on each element or segment of the Works and compare these activities against the amount of inspection and testing required by the Contract and the Contractor's quality plans;

(c) Show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the pass/fail criteria; and

(d) Summaries any actions proposed by the Contractor to overcome any nonconformity.

(3) The Engineer shall submit the same to the Employer along with his observations / comments before 15th working day of each month.

1.11.22 **Quality Records**

The Contractor shall ensure that all the quality records as objective evidence of the implementation of the quality management system are properly indexed, filed, maintained, updated and stored.

Attachment : QA-1

Design Certificate

[A Sample Format, subject to Consent by the Engineer]

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

[*Design Package No. .... / the Technical Design Submission/Technical Drawings Submission No. .... / Construction Design/Construction Drawings Submission no. ……. / Technical Submission No. ....] in respect of :

[description of the Permanent Works / Temporary Works (as applicable) to which the submission refers]

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

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

Designer's Statement :

We hereby certify that:

a) the design of the Permanent Works / Temporary Works (as applicable), as illustrated and described in the documents scheduled in 'Part A' below, complies with the Employer's Requirements and Specifications requirements and ..... [see note 1 below];

OR (in case of a Technical Design Submission in respect of those elements identified under the definitions of "Work Segments" specified in Clause 4.4 of Particular Specification [Basic Design Philosophy and Requirements for Design] and clause 1.8.10 of General Specifications vol. II [Design Submission Programme]to the Employer's Requirements)

the preliminary designs, design briefs and works specifications of those elements of the Permanent Works / Temporary Works (as applicable) as illustrated and described in the documents scheduled in 'Part A' below comply with the Employer's Requirements and Specifications requirements and ..... [see note 1 below];

OR (in case of a submission of documents that do not strictly comply with the previous documents for which "Notice of No Objection" has been received)

the design of the Permanent Works / Temporary Works (as applicable), as illustrated and described in the documents scheduled in 'Part A' below, complies with the Employer's Requirements and Specifications requirements and ..... [see note 1 below] except in the following respects:

(i) ..... (to be completed by the Contractor / Designer)

(ii) ..... (etc.)

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 'Part A' below;

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

AND (in the case of a submission covering a part of the Permanent Works / Temporary Works (as applicable) only) :

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 'Authorized Representative'

(for Designer M/s ----------)

Name

Position/ Designation

Date

Contractor's Certification :

This certifies that all design has been performed utilizing the skill and care to be expected of a professionally qualified, competent and licensed 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.

Signed by 'Authorized Representative'

(for Contractor M/s ----------)

Chief Design Engineer Name :	Contractor's Representative Name:
Position / Designation:	Position / Designation:
Date:	Date:
Place :	Place :

Note 1

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

(i) the Contractor's Proposal

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

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

(iv) The Technical Design

Part A

Submission no. .... comprises the following :

- Drawings : (Title, drawing number and revision)
- Documents : (Title, reference number and revision)
- others :

Part B

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

Document :

Submitted with

[*Technical Design Package No. ..……/

Technical Design Submission No……/

Technical Drawings Submission No. ..../

Technical Submission No. ..……/

Date of Issue of "Notice of No Objection"

The Contractor is required to provide this information in respect of each document in Part B

(* Delete as appropriate)

Part C

[Contractor to attach copies of necessary and required approvals]

1.12 System Safety, Reliability, Availability and Maintainability

1.12.1 Safety philosophy

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

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

1.12.2 Safety Management

(1) The Contractor shall implement the Contract Systems Safety Management Requirements, as referenced in the Project Safety Manual and elsewhere in the Specification, in consultation with the Employer's Representative.

1.12.3 Prescriptive Safety Criteria

(1) The Contractor shall identify and list all applicable statutory and regulatory requirements and codes of practice relevant to the design of the Works undertaken and to work within the constraints and limitations imposed by the requirements and codes.

(2) The safety of the Contractor's supplied systems and equipment shall be developed by the Contractor in accordance with the requirements contained in this clause and the clause 14.5 of Employer's Requirements -- Particular Specification.

1.12.4 Availability (Reliability and Maintainability)

(1) The reliability and maintainability of the Permanent Works shall be developed by the Contractor in accordance with the requirements contained in this clause and the clauses 14.2, 14.3 and 14.4 of Employer's Requirements -- Particular Specification.

(2) The Contractor shall prepare Availability and Maintainability plans as detailed in European standard EN 50126. The first draft of these plans shall be submitted to the Employer's Representative for review within 6 months of the Commencement Date of the Works.

1.13 Safety, Health and Environment (SHE) Requirements

1.13.1 The SHE requirements contain major items with respect to environmental and social considerations, and safety and health considerations for all parties including, people affected by the Works, Contractor's Employees, and the party involved in the Contract. Measures to the SHE requirements shall be taken by the Contractor in accordance with the requirements detailed in Project SHE Manual (Appendix 2) to this Employer's Requirements. Those are summarized below.

1.13.2 First, under the SHE requirements, the Contractor shall establish measures to carry out his design and construction process in highest standards of international environmental practice in compliance with all relevant Indian environmental and social laws, standards, codes and regulations. The Contractor shall incorporate the principles of good environmental practice and minimizing negative environmental and social impacts into the Works contained in the Contract.

1.13.3 Second, The Contractor shall at all times be solely responsible for maintaining the health and safety of all his employees and safety of the general public whilst exposed to construction activities whether on or off-site. The Contractor shall at all time take all the

precautions as necessary to maintain health and safety of all his employees during working hours and during hours in his employee's camp. His Employee's camp shall meet the requirements detailed in Project SHE Manual Appendix 2 (Safety, Health & Environmental Requirements for the Project.

1.14 Software Support, Management and Control

1.14.1 General

(1) The Contractor shall provide full support to the Employer and Engineer for all computer programs provided by the Contractor under the Contract. Contractor shall arrange for interfacing of his software with PMIS developed by the Employer.

(2) The Contractor shall submit a software support plan at least 28 days before commencement of software installation. This plan shall require the Contractor to provide all changes, bug fixes, updates, modifications, amendments and new versions of the program as required by the Engineer.

(3) The Contractor shall submit all new versions to the Engineer for review at least 2 weeks prior to their installation. New versions of any program shall not result in any discontinuity nor result in previous work being rendered ineffective. The Contractor shall provide all tools, equipment, manuals and training necessary for the Employer / Engineer to maintain and re-configure all the software provided under the Contract.

(4) New versions shall not result in non-conformance with the Employer's Requirements and Specifications, or degrade the operation of the system.

(5) The Contractor shall:

- ensure that all new versions are fully tested and validated on the simulation and development system prior to installation.
- ensure that all new versions are fully tested and commissioned once installed on the Site; and
- deliver to the Employer/ Engineer any new version, together with the updated Operation and Maintenance Manuals.

(6) The Engineer shall not be obliged to use any new version and that shall not relieve the Contractor of any of its obligations. Any effect upon the performance or operation of the computer controlled system that may be caused by a new version shall be brought to the Engineer's attention including updating the files to suit new version.

1.14.2 Security Obligations

(1) Within 14 days of the application of any software into the Permanent Works by the Contractor, the Contractor shall submit to the Engineer for retention by the Employer two backup copies of the software, which shall include, without limitation

- All licenses in favour of Employer, for their use.
- All source and executable code
- All design documentation relating to the software and
- Any specified development tools required for maintenance of the software including, but not limited to editors, compilers and linkers.

1.14.3 Error Correction

(1) When a fault is discovered within delivered software or documentation, the Contractor shall take necessary steps to rectify errors or faults at the earliest.

(2) The Contractor shall provide written details as to the nature of the proposed correction to the Engineer.

(3) The Contractor shall notify the Engineer / Employer promptly of any fixes or patches that are available to correct or patch faults.

(4) The Contractor shall detail any effect such fixes or patches are expected to have, upon the applications.

1.14.4 **Training**

(1) The Contractor shall provide training for the Employer / Engineer's staff to enable the Employer / Engineer to make proper use of any software and its new versions**.**

(2) To ensure the quality of software development process, the Contractor shall comply with the requirements of the BS EN ISO 9000-3:1997 "Guidelines for the application of ISO 9001 to Development, Supply and Maintenance of Software – Implementation Criteria". Where the software is to be supplied by an organization other than the Contractor, the Contractor shall pass on all requirements in their entirety and without modification. The Contractor shall, however, remain responsible for the execution of the Works.

1.15 Contractor's Coordination with Others

The Contractor shall fully integrate and coordinate the design and construction of the Works with Other Contractors and related bodies and entities including but not limited to Indian Railways, Railway Board, RDSO, as well as the designated contractors / consultants / service providers other than Other Contractors who are engaged in part of the Works and relevant statutory authorities, relevant public utility agencies and adjacent contractors who are or shall be working adjacent to the Site as referred to as the Interfacing Parties (wherever applicable), and shall actively seek out solutions to integration issues, and to anticipate, to plan for, and to comply with the needs of these related parties, which are properly required and consistent with the obligations under the Contract. The Contractor shall comply in this respect with the requirements of Chapter 17 of [Contractor's Coordination with Others] Employer's Requirements -- Particular Specification. Further details regarding design co-ordination with the other related entities are given in the Chapter 3 of this Employer's Requirements

1.16 Site Installation and Demobilization

1.16.1 All necessary Temporary Works regarding site installation such as Temporary Facilities and Temporary Utility Services shall be provided, equipped, and maintained by the Contractor for his own use, for his sub-contractors, for the Engineer and the Employer. The detailed requirements are described in Clause 4.3 of [Temporary Works] of this Employer's Requirements.

1.16.2 All the Temporary Facilities and Temporary Utilities Services as defined in Clause 4.3 of [Temporary Works] of this Employer's Requirements shall be provided, equipped, and maintained in good conditions and shall not be discontinued without the consent of the Engineer but not later than the issue of Taking-Over Certificate.

1.16.3 The Contractor shall also ensure that Temporary Facilities and Temporary Utility Services as provided do not interfere with the Permanent Works or prevent the installation and testing of the permanent services by others from interfering the Permanent Works. Where necessary the Contractor shall temporarily divert or relocate the temporary services in course of the

Works at the Contractor's cost. The detailed requirements are described in Clause 4.3 of [Temporary Works] of this Employer's Requirements.

1.17 Site Surveys, Investigations and their validation

Consequent upon Coordination Event No: CT-3

1.17.1 The contractor shall take up the Final Alignment verification and reviews of the various Employer's Drawings by the Contractor. The Contractor shall also carry out validation of the data as provided by the Employer and any additional surveys if considered necessary by the Contractor including any other geotechnical investigations to commence his specific designs as applicable to the site conditions.

1.17.2 Validation of the data and any additional surveys as considered necessary by the Contractor and geotechnical investigations are particularly important in this Contract which imposes on the Contractor a single point responsibility for the whole design and construction of the Works.

1.17.3 The Contractor shall plan and programme those validation and additional surveys if considered necessary and investigations required to commence the design of Works and develop them to the Survey Plan and Programme as detailed in and Clause 4.4 of [Basic Design Philosophy and Requirements for Design] - Employer's Requirements - Particular Specification and Sub-clauses 1.5.3 [Validation of Data, Additional Survey, Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements.

1.17.4 Any approval from the Engineer does not absolve the Contractor from his responsibility for accurately setting out the Works. The Contractor shall continue to be solely responsible for the accuracy of Permanent Works. It is the Contractor's sole responsibility to ensure that there are no obstructions to the Permanent Works of installation of Overhead Equipment or at the location of Traction Substations, Sectioning and Sub-Sectioning posts and AT Stations based on the validation of data and additional survey carried out by the Contractor. If any obstructions such as trees, structures or unchartered public utilities etc. exist, the Contractor shall locate the obstructions on the Site Location Maps or Structure Setting-out Maps with the procedure and method statement that addresses the handling of the obstructions, and submit to the Engineer for consent. Such obstructions shall be dealt with as per the provisions of the Contract.

1.17.5 The Contractor shall, thereafter, design the horizontal and vertical Alignment of the Overhead equipment (OHE) on open route and in Yards for each Station as per the Design Criteria specified in Specifications [Volume III of the Bid Documents], and within the available ROW giving due consideration to the various obligatory points e.g. points and crossings, Bridges, Level Crossings, ROBs etc. The OHE Alignment Plan and Profile Drawings including yard layout drawings for each Station, as finalized shall be submitted to the Engineer for his review and approval.

1.17.6 The Traction Installation at TSS, SSP, SP and AT shall also be located within the plots of lands acquired or within the ROW as charted out.

1.18 Project Management Information System (PMIS)

The Contractor shall devise and utilize a PMIS such that all documents generated by the Contractor can be transmitted to the Engineer by electronic 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 site office and Headquarter Office by the Contractor. The contractor shall develop his PMIS which will be compatible with the employer's existing PMIS and shall arrange for interfacing between the two. The documents

shall comply with the standards as specified in Sub Clause 1.10.1 of "CAD Document Standards" of this Employer's Requirements.

1.19 Contractor's Project Organizations

1.19.1 The Contractor shall have a competent team of managers, Engineers, technical staff, experts and support staff etc. so as to complete the work in a satisfactory manner in compliance with Employer's Requirements and Specifications. The designations of the various project organizations team members shall be accepted by the Engineer before adoption. Before deployment of supervision staff the contractor shall submit his detailed bio-data including qualification and experience for approval to the Engineer.

1.19.2 The Contractor shall establish an organizational and procedural scheme which ensures all the Works are carried out strictly in compliance with the Employer's Requirements and Specifications and for the benefit of the Employer throughout the Contractor's design/ build implementation as required in Employer's Requirement – Design/ Construction and clause 1.11 of [Quality Assurance] of this Employer's Requirements.

1.19.3 A control room with round the clock radio communication or telephone switch board links with all safety offices, Work Areas including but not limited to site offices, workshops, fabrication yard, off site offices, Engineer's Site Office and Huts, work trains, etc. shall be maintained and manned round the clock. Residences of all senior project team members shall also be linked with the control room. Vehicles for emergency use should be on stand-by at the control room around the clock.

1.20 Training and Skill Transfer

The Contractor shall ensure that the Employer's personnel and all local contractors and sub-contractors engaged on the Works are given the opportunity for the necessary training and skills transfer to the extent required in the various areas of the Traction Power Supply , OHE and SCADA Works such as Detailed Design, Foundation Works, erection testing and commissioning, safety, quality assurance, environmental protection, installation procedures and repair and maintenance and any other job trainings that facilitate efficient execution of the Works and their maintenance.

Mock up and demonstration models shall be provided as required by the Employer.

1.21 Public Relations

1.21.1 **Confidentialities of Information**

The Contractor shall not publish or otherwise circulate alone or in conjunction with any other person, any articles, photographs or other materials relating to the Contract, the Site, the Works, the Project or any part thereof, nor impart to the Press, or any radio or television network any information relating thereto, nor allow any representative of the media access to the Site, Contractor's Works Areas, or off-Site place of manufacture, or storage except with the permission, in writing, of the Employer. The Contractor shall ensure that his sub-contractors of any tier shall be bound by a like obligation and shall, if so required by the Employer, enforce the same at his own expense.

1.22 Monitoring of Progress: Monthly Progress Report & Three Months Rolling Programme

1.22.1 **General**

The Contractor shall submit to the Engineer, a Monthly Progress Report (MPR). This Report shall be submitted on the last working day 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 and referred to as the 'Report Month'. It shall

be submitted in a format to which the Engineer shall have given his consent, describing, but not limited to, the topics listed below.

1.22.2 Design Status

Status of design progress shall be reported including:

(1) a report detailing the design progress made for 'Technical Design', 'Construction Design, and 'As Built Records', as the case may be and outstanding issues to be resolved with solutions during the reporting period; and

(2) the progressive and detailed version of the Design Submission Programme or its sub-programme indicating actual achievement dates and forecast dates for outstanding items.

1.22.3 Physical Progress

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, in respect of all the items / sub-items of the milestones / cost centre in each Work Segment and shall, in particular, address interface issues, problems and resolutions, representation of progress measured in percentage terms compared with percentage planned as derived from the Works Programme.

The Physical Progress shall be reported including :

(1) a listed description of all Traction Works of Traction Power Supply consisting of work at TSS, SSPs and SPs and at AT stations and for Traction OHE Works as well as SCADA Works performed during the month with quantified progress and the updated Works Programmes as specified in Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements showing both scheduled and actual progress of each sub-item of the work corresponding to each milestone / cost centre pertaining to each Work Segment;

(2) the percentage of each main work activity completed as well as the projected percentage thereof to be completed to the end of the Report Month;

(3) the total overall percentage of the works completed as well as the projected percentage thereof to be completed in respect of each cost centre, each Work Segment and the project as a whole to the end of the Report Month, and with appropriate comments to explain any differences and how to regain any lost time or set-backs which may have occurred;

(4) a list of quantities of each major items of the Work (including temporary works) performed during the month vis a vis the total estimated quantities to be executed and illustrations showing the exact location of the work done.

(5) a list of major Works (including Temporary Works) schedules to be started within the next two (2) months and estimated quantities thereof. If the expected starting and/or completion dates are different from those shown on the updated programme, an explanation is to be given as detailed in Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements.

1.22.4 Coordination

Status and outstanding issues of coordination and interfacing activities with the Other Contractors and other entities described in Chapter 17 of [Contractor's Coordination with others] of Employer's Requirements -- Particular Specification Items to be reported shall include:

(1) a summary of the coordination and interfacing activities during the Report Month and details of outstanding actions; and

(2) a schedule of all submissions and consents/approvals outstanding as well as those obtained.

1.22.5 **Procurement**

Status of procurement of major items such as plants, equipment and manufactured materials, and material for the earthwork shall be reported including:

(1) a summary of all significant procurement activities during the Report Month, including action taken to overcome problems;

(2) a list of major items with description detailing their manufacturer, date of letter of credit, status of manufacturing and its origin, transportation and date of arrival at site (scheduled / actual), reasons for delay, if any and a quantities procured immediately and made available for the Works,

(3) Delays in procurement, if any, including reasons thereof and mitigation measures

1.22.6 **Programme Update**

Programme Update for the entire project shall include but not limited to the following items:

(1) The Monthly Programme Update which shall be prepared by recording actual activity completion dates and percentage of activities completed up to the twenty-fifth (25^{th}) of the month together with estimates of remaining duration and expected activity completion based on current progress. The Programme Update shall include

   (a) to account for the actual progress
   (b) updated Works Programme to reflect modifications in the design and construction Programme
   (c) status of the every Work in progress, its graphic representation (completed and remaining) in respect of the identified Works in the Report Month as well as for all the major Works and relevant activities; and
   (d) Progress 'S' curve indicating Base Line 'S' Curve for the accepted programme and physical Progress 'S' curve

(2) The Programme Update shall be accompanied by an Activity Report and a Narrative Statement which shall explain the basis of the contractor's submittal regarding:

   (a) Work Programme – explaining determination of activity duration and describing the Contractor's approach for meeting Co-ordination Dates as specified in the Contract.
   (b) Updated Work Programme – stating in the narrative, the Works actually completed and reflecting along the Critical Path in terms of days ahead or behind allowable dates. Specific requirements of narrative are:

      i. Identification of causes of actual and potential delays (if any) in respect of milestones, Coordination Dates and Contract Completion dates

      ii. Provide explanation of the Works affected due to delays and proposed corrective action / mitigation measures to achieve the milestones, Coordination Dates and Contract Completion dates and mitigation the potential delays

      iii. Identification of any deviation from previous month's Critical Path.

      iv. Clear identification of every activity with number and description for activities in progress and activities scheduled to be completed.

v. Provision of time required to cater for the Design Changes and Variation order, if any.

(c) Programme Status presenting:

i. Works Programme status up to and including the current Report Month with cumulative progress to date and a forecast of remaining work.

ii. Programme bar-chart size A3 and a time-related logic network diagram on an A1 size, including activity listings.

(d) Activity Variance Analysis analyzing activities planned to start prior to or during the Report Month but not started at the end of the period as well as activities started and/or completed in advance of the Works Programme.

1.22.7 **Three Month Rolling Programme**

(1) The Three Months Rolling Programme shall be an expansion of the Works Programme, covering sequential periods of three months.

(2) The Three Month Rolling Programme shall provide more detail of the Contractor's plan, organization and execution of the work within these periods.

(3) 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.

(4) The Three Month Rolling Programme shall be developed as a Critical Path Method (CPM) network, and shall be presented in bar chart and time-scaled network diagram format. Bar charts shall be presented on an A3 size and time-scaled networks diagrams on an A1 size reproducible media. Tasks in the programme shall be derivatives of and directly related to tasks in the approved Works Programme.

(5) 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 / suppliers.

(6) Each activity in the Three Month Rolling Programme shall be coded, or described so as clearly to indicate the corresponding activity in the Works Programme.

(7) The Three Month Rolling Programme shall be issued on a monthly basis.

1.22.8 **Three Month Rolling Programme Revisions and Updates**

(1) The Three Month Rolling Programme shall be extended forward each month as described above. Each submission of the Three Month Rolling Programme shall be accompanied by a Programme Analysis Report, describing actual progress to date, and the forecast for activities occurring over the next three-month period.

(2) If the Three Month Rolling Programme is at variance with the Works Programme, the Programme Analysis Report shall be accompanied by a supporting Narrative Statement describing the Contractor's plan for the execution of the activities to be undertaken over the three month period, including programme assumptions and methods to be employed in achieving timely completion.

(3) The Contractor shall revise the Three Month Rolling Programme or propose revisions of the Works Programme, or both, from time to time as may be appropriate to ensure consistency between them.

1.22.9 **Performance on Quality Management System**

The MPR shall also include the Contractor's monitoring report on performance of the Contractor's quality management system and shall include the following as a minimum:

(a) The submission status and review status of the quality system documents;

(b) An up-to-date audit schedule and status

(c) An up-to-date nonconformity register providing the status of all nonconformity identified by the Engineer or the Contractor within the reporting period and those nonconformities not yet satisfactorily closed;

(d) An narrative appraisal of the performance of the quality management system, including any nonconformities, shortcomings or problem areas identified and the corrective and preventative action taken or proposed; and

(e) All the pending issues / references with the Engineer, Employer and the Contractor and the action proposed

1.22.10 Financial Status

The MPR should also include the following aspects of the financial status:

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

(2) A spread sheet summarizing each major activity as defined in Clause 1.8 of General Specifications Vol. II [Project Programme Requirements], the budget, costs incurred during the period, costs to date, costs to go,

(3) A spread sheet indicating the status of all payments due and made.

(4) 'S' curve for the cash flow planned as per the Contract and as actual till the date of MPR including describing the variance

(5) A report of the status of any outstanding claims.

(6) The report shall in particular provide interim updated accounts of continuing claims.

(7) Any other information as required by the Engineer

1.22.11 Other Items

At minimum the following items shall be covered:

(1) a list of local labour (in man-date by trade classification) employed during the month and the statement about labour relations including shifts and hours of works executed and an explanation of any actual or potential problems;

(2) a list of expatriate personnel (in man-month by position) employed during the month;

(3) a table showing actual working hours of each items of construction equipment, a list of stand-by equipment and a list of unserviceable (inoperable) equipment describing action being taken to get it back in operation;

(4) a quantity list of the Contractor's construction materials consumed or used during the month and accumulated quantities thereof;

(5) photographs called for in Clause 4.21 [Progress Report] in the Conditions of Contract:

(6) a summary of quality control tests (routine tests and check tests) performed on the materials and the products for the Permanent Works during the month including results (in values) of performance on each test and contrasted fluctuations of the properties with the specified range of their acceptability,. The results of Quality Audits shall be summarized in the Contractor's monthly reports.

(7) a general description of the weather, listing rainfall in mm, maximum and minimum temperatures, and river water levels, for each day through the month;

(8) a statement concerning the effectiveness of the safety/security activities including a list of each accident involving the hospitalization and/or death of any person and list of any

major thefts. Also a list of any accidents in which equipment was damaged to the extent it become inoperable, and any fire which occurred;

(9) a list of the amount and date of each payment received and amount of any monthly invoice which has been submitted but not yet paid;

(10) a list of claims (if any) submitted during the month, including claim amounts and extension(s) of time;

(11) a table of updated cash flow estimate;

(12) a list of letters, drawings, and documents received from or submitted to the Engineer and/or Employer during the month;

(13) Resources Mobilization: Status in respect of key persons and major construction material indicating the resources already available at Site and the proposed mobilization schedule for the next three months and

(14) construction equipment report including:

(a) a list of all the construction equipment located at the Site vis-à-vis required during the month to achieve targeted progress (segment wise);

(b) daily working and operation records of each item of equipment;

(c) inspection, repair and maintenance records;

(d) quantities of fuel, lubricant, oil and tires consumed;

(e) overhauling records;

(f) accident reports; and

(g) a list of unserviceable equipment and action being taken to put back in operation.

(h) Schedule of mobilization of the construction equipment required at Site for the next three months

(15) Status of all the Temporary Works including temporary facilities and utility services for Contractor's use

(16) Status of temporary facilities and utility services for the use of Engineer / Employer

(17) Assistance required from the Employer

1.22.12 The Contractor shall submit to the Engineer 6 copies of a Monthly Progress Report (MPR), as described in Clause 1.22 of [Monthly Progress Report] to this Employer's Requirements, describing the progress and current status of the Works. The MPR shall address the matters set out in the Works Programme.

1.22.13 The MPR shall be divided into two sections. The first section shall cover progress and current status relating to design and the second section shall cover physical progress and current status relating to construction including co-ordination, procurement and other miscellaneous items.

1.22.14 A monthly meeting to monitor the progress of the project shall be convened by the Engineer. Contractor's Representative and Representative of all the Other Contractors / Interfacing Parties (as required) shall also attend the meeting. The meeting shall be chaired by the Employer.

1.22.15 The Engineer shall record the proceeding of the monthly meeting and shall circulate the copies of the record to all the concerned and as instructed by the Employer

1.22.16 **Management Meetings**

(1) The Employer or the Engineer will require the Contractor to attend a management

meeting in order to review the resource mobilization for future work, works progress or other issues. The Engineer shall record the proceeding of the management meetings and shall supply copies of records of to all those in attendance and as instructed by the Employer.

(2) The items to be discussed at the management meetings will be set out at the first meeting with the concurrence of the Contractor, the Employer and the Engineer.

(3) The minutes of the meeting signed by the Contractor, the Employer and the Engineer shall constitute an official record of matters discussed, but shall not replace any requirement in the Contract for approvals, instructions or decisions to be submitted in writing.

(4) The Contractor shall copy all correspondence, notices and documents related to the management meetings and send them to the Employer, the Engineer and those parties as instructed by the Employer prior to the meeting.

(5) The Contractor shall, when requested with reasonable notice, attend any other meetings convened by the Employer, the Engineer to review works progress or other relevant issues.

1.22.17 A copy of all the reports, as submitted by the Contractor to the Engineer shall be submitted to the Employer by the Engineer along with his comments within 7 days of its submission by the Contractor.

1.23 Maintenance Manual

1.23.1 The Maintenance Manual shall be submitted as part of the Technical Design and shall include full details of the long term inspection and maintenance operations for each major component including Traction Power Supply, Overhead Equipment, SCADA, firefighting equipment and water supply, drainage and sewerage, etc of the Traction Installation.

1.23.2 In addition to the various existing Codes and Manuals including (ACTM) of Indian Railways as applicable for Operation & Maintenance of Traction Installation and other assets, the Contractor shall provide the additional provisions (if any) to the applicable IR Manuals required for the Operation and Maintenance of various assets created as per the Contract. It shall include but not limited to those identified in Chapter 5 of this Employer's Requirements – Manufacture, Installation, testing and commissioning.

1.23.3 The additional provisions as above shall also include inspection checklist / formats for each area and shall cover but not limited to inspection frequency, items to be inspected, criteria for acceptance, criteria for remedial works and details of the remedial works, including proposed materials and method statements, long term monitoring regime (if any).

1.24 Intellectual Property Rights and Royalties

1.24.1 The Contractor shall indemnify the Employer and the Engineer from and against all claims and proceedings on account of infringement (or alleged infringement) of any patent rights, registered designs, copyright, design, trademark, trade name, know-how or other intellectual property rights in respect of the Works, Contractor's Equipment, machines, work method, or Plant, or Materials, or anything whatsoever required for the Works and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall pay all traffic surcharges and other royalties, license fees, rent and other payments or compensation, if any, for getting stone, sand, gravel, soil/ earth or other materials, machine, process, systems, work methods, or Contractor's Equipment required for the Works. The Contractor shall, in the event of infringement of Intellectual Property Rights, rectify, modify or replace at his own cost the Works, Plant or materials or anything whatsoever required for the Works so that infringement no more exist or in the alternative shall procure necessary rights/license so

that there is no infringement of Intellectual Property Rights.

1.24.2 The Contractor shall be promptly notified of any claim under this Sub-Clause made against the Employer. The Contractor shall, at his cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Employer or the Engineer shall not make any admission which might be prejudicial to the Contractor, unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of Contractor failing to act at Engineer's notice, the Employer, in addition to any other remedy as deemed necessary, shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under this Contract or any other Contract.

1.24.3 In so far as the patent, copyright or other intellectual property rights in any Plant, Design Data, plans, calculations, drawings, documents. Materials, know-how and information relating to the Works shall be vested in the Contractor, the Contractor shall grant to the Employer, his successors and assignees a royalty-free, nonexclusive and irrevocable license to use and reproduce any of the works, designs or inventions incorporated and referred to in such Plant, documents or Materials and any such know-how and information for all purposes relating to the Works (including without limitation the design, manufacture, installation, reconstruction, testing, commissioning, completion, reinstatement, extension, repair and operation of the Works).

1.24.4 If any patent, registered design or software is developed by the Contractor specifically for the Works, the title thereto shall vest in the Contractor and the Contractor shall grant to the Employer a non-exclusive irrevocable and royalty-free license to use, repair, copy, modify, enhance, adapt and translate in any form such Software for his own use.

1.24.5 If the Contractor uses proprietary software for the purpose of storing or utilizing records, the Contractor shall obtain at his own expense the grant of a license or sub-license to use such software in favour of the Employer and shall pay such license fee or other payment as the grantor of such license may require provided that the use of such software under the license may be restricted to use relating to the design, construction, reconstruction, manufacture, completion, reinstatement, extension, repair and operation of the Works or any part thereof.

1.24.6 The Contractor's permission referred to above shall be given, inter-alia, to enable the Employer to disclose (under conditions of confidentiality satisfactory to the Contractor) programmes and documentation for a third party to undertake the performance of services for the Employer in respect of such programmes and documentation.

1.24.7 If any software is developed under the Contact or used by the Contractor for the purposes of storing or utilizing records over which the Contractor or a third party holds title or other rights, the Contractor shall permit or obtain for the Employer (as the case may require) the right to use and apply that Software free of additional charge (together with any modifications, improvements and developments thereof) for the purpose of the design, manufacture, installation, reconstruction, testing, commissioning, completion, reinstatement, extension, repair, modification or operation of the Works, or any part thereof, or for the purpose of any Dispute.

1.24.8 The Employer reserves the right to use other Software on or in connection with the Works.

1.25 Acknowledgement by the Contractor

1.25.1 The Contractor shall be deemed to have satisfied himself and shall be responsible about the correctness and sufficiency of the Contractor's Proposal to cover all his risks, liabilities and obligations set out in or implied by the Contract and all matters and things necessary for the proper design, procure, manufacture, execution, installation, completion, testing (including Integrated Testing), commissioning of the Works and remedying of defects.

1.25.2 The Contractor shall be responsible for ascertaining and securing the Contractor's obligations as described herein from (1) to (6) at his own cost:

(1) Conditions bearing upon the proper transportation, disposal, handling and storage of materials (including but not limited to hazardous toxic substances and excavated materials).

(2) Availability and costs of electricity, water and gas.

(3) Availability and rates of employment of skilled and unskilled manpower.

(4) The character and quantum of equipment and facilities needed preliminary to and during the design, procurement, manufacture, installation, execution, testing (including Integrated Testing) and commissioning of the Works and remedying of any defect.

(5) The protection of the environment and adjacent structures which will be necessary preliminary to and during the design, procurement, manufacture, installation, execution, testing(including Integrated Testing) and commissioning of the Works and remedying of any defect.

(6) The location of and the authorization required for and the means of diversion and facilities required for the purposes of the Works.

END OF CHAPTER

2 FUNCTIONAL REQUIREMENT

2.1 Objective & Scope of Works

2.1.1 The purpose and function of the Contract and the Bid Documents is to execute the works in all respects of design, construction, test and commissioning including integrated testing and commissioning of the works by the Contractor and finally handing over the same to the Employer. The works includes contractor's obligation of defects liability during Defect Notification Period to provide all support for operation and maintenance by the Contractor in the manner and in time stipulated by the Contract and to achieve the standards, performance and functionality specified in the Contract.

2.1.2 In full recognition of this purpose, and with full acceptance of the obligations, liabilities and risks that may be involved, the Contractor shall undertake the design, based on their computer simulation of train operation for the projected traffic for the horizon year 2031 A.D. to be run over the section finalize supply specifications for procurement of components, manufacture, verification, delivery, construction, installation of equipment, testing, construction, manufacture, supply, installation, testing including integrated testing, and commissioning, technical support, supervision of maintenance , training of employer's staff and documentation for a complete system necessary to provide Traction Power supply from 220 kV\132 kV Traction Substations, through 2 X 25 kV Traction Overhead contact lines (OHE) capable of running double stack containers on flat wagons, complete with a Central Supervisory Control and Data Acquisition System (SCADA) for running trains hauled by 9000 h.p. electric locomotives, a proportion of which shall also be in long haul (two train) formation on the Western Dedicated Freight Corridor including and without limitation, the design, construction and removal of all the Temporary Works and handover the completed Works to the Employer in a condition in which the Employer can immediately use the Works for the intended purpose. In full recognition of these objectives and with full acceptance of the obligations, the Contractor shall execute the Works taking into account all liabilities and risks that may be involved.

2.1.3 Design of the Works shall be developed in accordance with the Employer's Requirements and Specifications under the Contract to the different phases of the Contractor's Technical Design proposals, consent of which by the Engineer is deemed to be completion of the particular phase of the designs. Procedure of the design development is described in this Employer's Requirement – Design (Chapter 3)

2.1.4 The System Design shall be carried out jointly along with the Other Contractors. This includes track and track structures, electrification of the line, signaling systems with automatic block signaling, telecommunications and implementation of train radio and a SCADA control system with the Main Operations Control Centre.

2.1.5 Construction, installation, Testing and commissioning shall be carried out in accordance with the Specifications and with procedures established by the Contractor through his quality management system as also developed by him meeting the requirements as detailed in clause 1.11 of [Quality Assurance] of this Employer's Requirements and meeting the Safety, Health and Environment (SHE) requirements as detailed in Appendix 2 Project SHE Manual to this Employer's Requirements and other requirements under this contract and subject to consent by the Engineer.

2.1.6 The Contractor shall be responsible for obtaining all necessary approvals from the relevant authorities in Design, Construction and Commissioning of the Works.

2.1.7 In addition, the Contractor shall be responsible for rectification of the defects appearing in the Permanent Works in the manner and to the standards within the time stipulated by the Contract.

2.1.8 A copy of all the correspondence being exchanged between the Contractor and the Engineer pertaining to the Contract shall also be endorsed to the Employer for his information by the respective parties.

2.2 Contract Requirements

2.2.1 The Design and Performance of the Permanent Works shall comply with the specific requirements contained in the Contract.

2.2.2 The Specifications enclosed with the Bid Documents are the minimum specific requirements. The Contractor shall further develop these Specifications together with the specifications included in the Contractor's Technical Proposal in to the detailed Works Specifications / Method Statements and Test Procedures / works procedures / Plans and Manuals / Technical Drawings / Construction Drawings / Sketches etc. giving due consideration to the requirements as per Design Criteria (as included in the Specifications) and various Codes and Standards as identified therein and best Engineering practices as applicable and submit to the Engineer for his consent during the Design Phase.,

2.2.3 In addition, the Contractor shall also comply with Indian Railways (IR) codes, rules and regulations for works to be carried out within the DFC and IR Railway kinematic Structure Gauge.

2.2.4 The Alignment Plan and other data such as Site Plans for TSS, SSP and SPs , as available with the Employer, is included in the Employer Drawings (Volume V of the Bid Documents) and is only for information and reference of the Contractor and the Employer does not claim accuracy / sufficiency of the same. These are subject to the Final Alignment Plans as made available by the Employer on Occurrence of the Co-ordination Event No. CT 3 (Submission of Complete Validation of Data provided by the Employer) for each of the Packages CT P-1, CT P-2 and CT P-3 and shall be supplemented by verifications / additional investigations if considered necessary by the Contractor for development of his Technical Design at his own cost. No claim shall be entertained by the Employer in case the Contractor encounters the data different than that included in data Book during the verification / additional investigation. The Contractor shall be responsible for the Geology and the Geotechnical parameters of the sub-surface strata along the alignment as required for his Technical Design submittals. No claim shall be entertained by the Employer in this regard.

2.3 Scope of Works

2.3.1 The Scope of Works has been defined in Para: 2.1. The proposed alignment of Packages CT P-1 (Rewari – Ajmer Section), CT P-2 (Ajmer – Ikbalgarh) and CT P-3 (Ikbalgarh-Vadodara) of Western Dedicated Freight Corridor project is located alongside the existing IR tracks. While the tracks pertaining to packages CT P-1 and CT P-2 lie on the east side of the Tracks of North Western Railway those for package CT P-3 lie partially on the North Western Railway and partly on the Western Railway and partially at the Southern end on the West of Western Railway.. The tracks run generally parallel to the existing IR tracks, except in areas of dense habitation where these have been located on diversions.. It is intended to design and construct the system as double line electrified track with 2x25kV, 50 Hz. overhead catenary system capable of operating double stack container trains on flat wagons at a maximum train speed of 100 km/h .with an initial axle load of 25.0 tonne. Formation and bridge structures are to be provided for 32.5 tonne axle load and the track structure for 25 tonne axle load. Provision is to be kept In the track and Traction Overhead equipment to raise the tracks by 275 mm where the track structure is raised to 32.5 t.

2.3.2 The Work shall include any associated works relating to satisfactory completion of the Work defined above on Design-Build lump sum price.

2.3.3 For the purpose of clarity and better understanding, the entire Scope of Work, has been sub-divided in to following three sections from different perspectives.

(1) Scope of Work with respect to Work Areas

(2) Item-wise Scope of Work

(3) Associated Works and Temporary Works

2.3.4 Scope of Work with respect to Work Areas

The Scope of Works is identified but not limited to the following with respect to the Work Areas;

All the chainages / lengths as indicated below are indicative and approximate which shall be firmed up by the Contractor on occurrence of Coordinated Event No. CT - 3 (Submission of Complete Validation of Data provided by the Employer) pertaining to all the contract packages CT P-1, CT P-2 and CT P-3.. These shall be further reviewed and firmed up by the Contractor during Technical Design and subject to consent by the Engineer

(1) Work Areas for Main Line.

Entire main Line open route for provision of Traction Overhead Equipment on the tracks on the route

(2) Work Areas at Junction Stations including those on the connecting lines to IR route up to the neutral section and at crossing stations.

(3) All lines as shown in the Wiring Plans .These shall include the work areas for provision of Overhead Equipment on the connecting lines to IR electrified routes up to the location of the Neutral Section as agreed with the Railway by the Employer..The Work areas at Plots of land selected for construction of Traction Substations, Sub-Sectioning Posts, Sectioning Posts and the Auto-transformer Stations at Chainages approved by the Engineer and proposed by the Contractor on the Final OHE Lay Out Plans developed from the Final Alignment Plans.

(4) The Work area at the Location of Operations Control Centre for installation of the Traction SCADA works at OCC (Operations Control Centre).

(5) Work Areas for Temporary Works

The Work Areas for the Temporary Works as indicated in the Employer's Drawings and / or as arranged by the Contractor and as agreed to by the Employer.

(6) The width of the available Right of Way (ROW) for the Permanent Works at different chainages w.r.t the existing IR tracks and where the route diverts on the Alignment Plan as well as in the Table of ROW shall be as indicated in the DATA BOOK, Volume IV. The said ROW boundary will also be available as shown on the Final Alignment Drawings for reference

2.3.5 Scope of Item-Wise Works

The Scope of Work as identified including but not limited to the following and is subdivided into item-wise Works to further clarify the Scope of Work.

(1) Train Simulation at the proposed traffic to be hauled in the year 2031 and as derived thereafter the Sizing of Components of Traction Power Supply and conductors and their fittings for satisfactory operation of the System.

(2) Basic and General design of Traction Power Supply and OHE.

(3) A study of effect of Electromagnetic Induction on the adjoining metallic structures and the rails, as well as the system of adjoining Indian Railway alignment and their mitigation measures to render the system compatible with the Installation and to ensure rail and metallic structure of the Railway System remain safe for touch potential.

(4) Designs and drawings of assemblies and sub-assemblies of traction Power Equipment and of OHE components.

(5) Specifications of component items and fittings their tests including type tests and approval

(6) [Validation of the Data and Additional Surveys] Validation of the Site Data provided by the Employer including additional surveys if considered necessary by the Contractor for design of the Permanent Works

(7) **[Geotechnical Investigations]** The Geotechnical Investigations required for Design of Permanent Works and as described in Employer's Requirement – General for design of Permanent Works.

(8) Civil Engineering Works and electricity utilities including preparation of land, leveling at Traction Substations, SSPs and SPs including spreading gravel in the switch Yards, earth mats, foundations, cable trenches, Fencing and construction of Road within the TSSs and Buildings complete with their indoor and outdoor electrification, water supply and sewage, drainage etc.

(9) Erection of Steel works and installation of Equipment at the Supply Control Posts.

(10) Earthing, Bonding and Lightning Protection works at Supply Control Posts and at AT Stations.

(11) Foundations, structure erection and Wiring of main Lines and yard lines based on approved OHE lay out Plans. OHE Profile Drawings under Overline structures and at special locations.

(12) OHE construction on long Bridges and viaducts.

(13) OHE works under restricted clearance of Overline structures.

(14) OHE, Power Supply and SCADA Works at stations including at junction stations for interconnection with Indian Railway Network.

(15) 240 V ac Single Phase auxiliary supply from 25 kV OHE through structure mounted 25 kV/240 V auxiliary Transformers at Supply Control Posts.

(16) GIS Mapping of all the traction installation and structures.

(17) 240 V ac Single Phase auxiliary supply from 25 kV OHE through structure mounted 25 kV/240 V auxiliary Transformers on the open route to Signal and telecom huts and Manned level crossings, and at stations as an alternative Emergency Supply.

(18) Design Earthing and Bonding scheme for the entire route including those for the adjoining IR Route and monitor the completion of the Works of Other Contractors and other Parties, through interface coordination to ensure the DFCC system as well as the adjoining Indian Railway routes are safe and compatible to 2 x 25kV ac traction System, as a prerequisite to tests and commissioning of electric traction on the system.

(19) [Coordination with others] The Coordination and Interfacing with the Other Contractors and the Interfacing Parties for all other relevant works.

(20) [Relevant Approvals / Clearances] Obtaining all the necessary approvals / clearances to work including clearance from Commissioner of Railway Safety (CRS), relevant Certificates and/or Clearances from Local Authorities viz. completion Certificates, Fire Clearances etc. as required.

(21) Interconnection of Power Supply from State Electric Supply Authorities at the Employer's traction Substations.

(22) Tests and Commissioning,

(23) Integrated Testing.

(24) Signages as required

(25) Miscellaneous Works such as:

(a) Landscaping as required

(b) Entrance to TSS, SSP and SPs

(c) Fencing and its earthing all around the TSS, SSPs and SPs

(d) Rain Water Harvesting System

(e) All other building services: furniture, firefighting Equipment including all fittings and fixtures as necessary for functioning of the Traction Installations

(f) Provision of shock treatment charts and other safety items as required under local regulations.

2.3.6 Associated Works and Temporary Works

(1) **[Temporary Diversions and Restoration]** All the necessary temporary traffic diversions and traffic management, waterway diversions / diversion of the natural water flow etc. as required for execution of the Permanent and Temporary Works and ensuring smooth flow of the same during construction and restoration of the same on completion of the Works.

(2) The temporary barricading / fencing of the area shall be required while working in the vicinity of IR tracks, without affecting the structure gauge of the IR.

(3) Provision of all Temporary Facilities and Temporary Utility Services for the use of the Employer and the Engineer, as detailed in Clause 4.3 of [Temporary Works] of this Employer's Requirements.

(4) All the Temporary Works associated with the Permanent Works including but not limited to:

(a) Access roads to Site as required

(b) Temporary bridges, if required

(c) Dismantling of the portion of existing structure (wherever and to the extent required) for the purpose of constructing Permanent Work adjacent to it, with the prior consent of Engineer and approval of Employer.

(d) Temporary Facilities and Temporary Utility Services as required by the Contractor for the safe execution of the Permanent Works

(e) Temporary Signages as necessary for safe movement of public and construction machinery

(f) Any other temporary works as required for execution of the Permanent works and removal of the same on completion of the Works.

(5) **[HIV/AIDS Activities]** HIV-AIDS awareness programme as described in Clause 6.7 [Health and Safety] of the Conditions of Contract

2.3.7 The Works at TSS shall include but not limited to the following:

(a) Connecting the water supply mains and sewage disposal mains at each Traction Sub-Station with the existing network of the DFCC or local municipality (the portion of the work outside Right of Way only)

(b) Design & construction of bore wells including related pumps and water treatment system at Traction Substations. (if necessitated due to non availability of the potable water supply from local municipalities),

(c) Design & construction of sewage disposal system e.g. soak pits, septic tanks etc. at Traction Substations. (if necessitated due to non availability of the existing network from local municipalities for disposal of the discharge from the Stations),

(1) Landscaping at Traction Sub-stations Stations

(2) Office Furniture and Equipment required for Operation of the Station

(3) Temporary Facilities of providing Service Vehicles including their servicing and maintenance for the use of Employer and Engineer.

2.4 Clearances

2.4.1 The Works shall not infringe the Structure Gauge (As applicable to the Western Dedicated Freight Corridor capable of running Double Stack Containers on Flat Wagons: as provided in Schedule of Dimensions, 2012, for Dedicated freight Corridors) and with respect to Indian Railways tracks as per Schedule of Dimensions for Broad Gauge of Indian Railways, 2004, (with Latest Amendments).

2.4.2 The Contractor shall make all provisions and considerations for the Other Contractors to install railway operating equipment without infringement of the structure Gauge.

2.4.3 The Contractor shall comply with the requirements of clearances, (structural and electrical) to be provided in respect of all railway, roads and structures in accordance with requirements of relevant authorities, Indian Railway Standards and Codes including Schedule of Dimensions 2012, ACTM, Indian Standard Codes and any other laws and regulations in force in India in the course of work execution. For the requirement of various clearances, a reference shall be made to the Sub-clause 9.2.2 of the Particular Specifications (Volume III of the Bid Documents).

2.4.4 The Contractor shall design the Works to be contained totally within the available Right of Way, respecting the relevant laws and regulations being practiced in India. Accordingly the Alignment of OHE Structures shall be so designed that the structures remain contained within the available ROW only or remains within the area of plots of land acquired for the purpose of construction of TSS, SSP, SPs and AT Stations

2.5 Interface Requirements

2.5.1 Apart from earthing and Bonding and other modifications required for mitigation measures required against EMI from 25kV traction, there shall also be need for interface requirement with all Other Contractors and third parties such as Indian Railways, Power Supply Authorities for access to works for provision of OHE and other Traction works involving space for traction structures, supports on bridges, viaducts for OHE, Location of signals, with respect to OHE installation as well as of switching off locomotives at neutral sections and finally system proving tests.

2.5.2 Therefore, an interface management plan shall be prepared by all the Contractors which has been detailed in Particular Specification in a greater detail. The interface will cover all Other Contractors, Indian Railway and Power Supply Authorities. Further interface requirements are given in Chapter 17 of Particular Specification.

2.6 Operational Requirements

2.6.1 The Works shall be designed and constructed to permit the Railway to operate continuously and satisfactorily seven days per week, at a maximum capacity of train interval of 12 minutes single headed or double headed hauling bulk and/or double stack container trains with 9000 HP Electric engines at the maximum design train speed of 100 km/hr for the designed traffic

requirements. The design of the Works shall be such that the systems and sub-systems are fail-safe, train operations, do not risk the safety of public and railway employees including during emergency situations. In the construction of the Works, the Contractor shall, as a fundamental objective and as a priority, ensure that the public and railway employees shall, throughout the operational period of the project and within the confines thereof, be provided with as safe an environment as is reasonably possible. For maintenance Works 4 hour possessions shall, however, be available on different sections as combined blocks for all disciplines according to predetermined maintenance programme during its operation.

2.6.2 Particular attention is also drawn towards the requirements of inspection by the Electrical Inspector to the Government (EIG) and Commissioner of Railway Safety (CRS) for safety clearance before commissioning of the Works. The Contractor shall assist the Engineer / Employer in preparing and submitting the documentation for the same to the EIG and CRS. Contractor shall facilitate and assist EIG and CRS in carrying out their inspections and shall carry out any changes / rectifications / modifications and making good any deficiencies in the Work as required for obtaining the safety clearance from the CRS.

2.6.3 Particular attention shall be paid to the existing IR track ways, stations and any other related facilities so as not to affect the railway operations. The Contractor shall consult with IR through Engineer and Employer with respect to this matter and shall include the agreement resulting from the consultation in his Works Programme and his Construction Method Statement and relevant drawings and documents as part of his Technical Design development. The attention may include:

(a) precautionary measures to ensure the safety of the IR moving trains;

(b) precautionary measures to existing IR railway properties including, but not limited to, rail tracks, embankment, railway structures, electrical and communication cables, and other railway operation facilities/ equipment.

(c) the works to be executed in the specified traffic block;

(d) treatment of unchartered embedded items along the existing IR embankment; and

(e) emergency procedures in case of an accident.

Maintenance activities of the Indian Railways for their tracks and structures adjacent to the Work, it is a requirement that Indian Railway remains operational during the execution of the Work.

2.7 Functional requirements for Fire Protection System in the TSS & Supply Control Posts

2.7.1 Fire Protection including fire detection, alarm and fire suppression system along with complete installations shall be provided in accordance with the Specifications and National Building Code of India and shall comply with the requirements of local fire service regulations to the extent applicable

2.8 General Responsibilities of the Contractor

2.8.1 The Contractor shall design, manufacture, execute, install, complete, all tests (including Integrated Testing) and commission the Works, including provision of Construction and/or Manufacture Documents, within the Time for Completion and shall remedy any defects as per the Contract. The Contractor shall provide all superintendence, labour, Plant, Materials, Contractor's Equipment, Temporary Works and all other services, whether of a temporary or permanent nature, required in and for such design, manufacture, execution, installation, completion, testing (including Integrated Testing) and commissioning and remedying of defects.

2.8.2 The Contractor's responsibility shall not be in any way be diminished nor shall the Contractor's design approach be limited by the Engineer's acceptance of the Contractor's guidance or recommendations as to the Engineering standards and design specifications, or

by the Engineer's approval, suggestions or recommendations or any aspect of the Engineering or design.

2.8.3 In addition to the above, the Contractor shall undertake various incidental works including but not limited to:

(a) Testing of the elements of the Works, Components, Structures for their electrical and structural conformity to the Design and Specifications, if required, and preventive as well as corrective actions,

(b) traffic management around work sites,

(c) reinstatement of the existing roads, utilities and services (to the extent disturbed by the Contractor),

(d) obtain approval for traffic block or otherwise from Indian Railways through Engineer and Employer, as required

(e) obtaining relevant certificates or clearances / acceptance from local civil authorities viz. completion certificates, fire clearances etc.

2.8.4 During the Possession / Traffic Block of the Indian Railway Operations in respect of the existing tracks, the Contractor shall comply with the requirements as specified in Chapter 18 [Possession Management] of Employer's Requirements -- Particular Specification

2.8.5 Before commencing design, the Contractor shall satisfy himself regarding the Employer's Requirements and Specifications. The Contractor shall give notice to Engineer of any error, fault, discrepancies or other defects in the Employer's Requirements or such items of reference within the period specified in Clause 5.1 of Conditions of Contract and Appendix to Bid. After receipt of such notice, the Engineer shall determine whether Clause 13 [Variations] shall be applied.

2.9 Traffic Management

2.9.1 The Contractor shall carry out the Works so as to minimize disruption to rail, road and pedestrian traffic. The Contractor shall prepare his Traffic Management Plan based on his proposed construction methodology and he shall implement the Traffic Management Plan throughout the whole period of the Contract and modify the same to the extent required during currency of the Contract in consultation with the local authorities and Engineer.

2.9.2 The requirements for the Traffic Management and the Traffic Management Plan are fully detailed in the Project SHE Requirements are annexed to this specification and the specific requirements of Construction as detailed in Particular Specification

2.10 Standards

2.10.1 Equipment, materials and sub-systems (as required within the Scope of Works) shall be designed, manufactured and tested in accordance with the latest issue of approved and recognized codes and standards defined and proposed by the Contractor and approved by the Engineer for the Work and best Engineering practices.

2.10.2 The Contractor shall submit two original copies (latest publications in English) to the Engineer of all the Codes, Codes of Practice, Standards, and Guidelines proposed to be used for the work including those listed in the Specifications.

2.10.3 References to "standards or to materials and equipment of a particular manufacturer" in the Bid Documents shall be regarded as followed by the words "or better".

2.10.4 The Contractor may propose alternative standard materials, or equipment that shall be equal

to or better than those specified and compatible with Specifications / requirements defined under the Contract and their use shall be subject to the consent of the Engineer.

2.10.5 Abbreviations governing specifications and climatic conditions generally applicable are given in Chapter 19 of Employer's Requirements - Particular Specification.

a) .

END OF CHAPTER

3 DESIGN REQUIREMENT

3.1 General

3.1.1 The Employer's Requirements - Design, specifies the requirements for the preparation and submission of the design of the Works and shall be read in conjunction with the Clause 4.4 of [Basic Design Philosophy and Requirements for Design] & Chapter 17 [Contractor's Co-ordination with others] of Employer's Requirements -- Particular Specification and Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements and other relevant Appendices as applicable. These requirements are subdivided into those that are to occur during the Design Phase, those that are to occur during the Construction Phase, and those that are of general application.

3.1.2 The Contractor shall be responsible for the design of the Works and shall ensure his design is accurate and in compliance with the Employer's Requirements and the Specifications which are deemed to be part of the Contract as defined in Conditions of Contract. The Contractor shall be responsible and ensure that the Works are fit for the intended purposes as specified in the Contract.

3.1.3 The Contractor shall establish an office for his dedicated design team in the Main Site Office of the Contractor and referred to as Design Team. The Design Team shall function from this office and all meetings and discussions relating to design shall be held in this office or in the office of Engineer / Employer and / or as instructed by the Engineer. In addition to the requirements herein, the Contractor shall, whenever the Engineer so requests, provide information and participate in discussions that relate to design matters.

3.1.4 The members of the Design Team shall have the experience and qualification appropriate to the type and magnitude of the design involved. Full details regarding their qualifications and experience shall be submitted to the Engineer for his consent.

3.1.5 To clarify the responsibility and the authority, the Contractor shall also establish a Construction Team independent of the Design Team. Thereby the Contractor is responsible for assuring the quality of the Works governed by his ISO 9001 (design- build) – Quality Management System and his tailored quality management system specifically to the Contract and the requirements as described in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements. The integrated system thereby to assure the quality of the Works in this Contract is referred to as the Project Quality Assurance Plan.

3.1.6 The Contractor shall ensure that the Design Team continues to be represented at Site at all times by staff whose seniority and experience are to the satisfaction of the Engineer and whose representative is available on the Site as necessary or as required by the Engineer. As per Clause 6.9 [Contractor's Personnel] of Conditions of Contract, if the Engineer asks (in writing) the Contractor to remove a person of his Design Team stating the reasons thereof, the Contractor shall ensure that the person leaves the Site within seven (7) days and shall have no further connection with the Works in the Contract.

3.1.7 During the Design Phase (Technical Design Stage and Construction Design Stage), the Contractor shall comply with all the requirements pertaining to Safety, Health and Environment as specified in Project SHE Manual detailed at Appendix 2 [Safety, Health and Environment] to this Employer's Requirements.

3.1.8 If there are discrepancies between documents referring to on the same subject, the more stringent criteria shall be followed, unless otherwise the order of precedence described in the relevant documents is not applicable

3.1.9 All technical solutions, schemes, structures, materials etc. shall be fully compatible with those used by the beneficiary and should not be in conflict with the applicable rules / codes / manuals and standards as well as legislations in India.

3.1.10 The Contractor shall co-ordinate with the other contractor for Building and Track Works,(Packages CT P-1, CT P-2, CT P-3 and CT P-3A) in regard to Public Consultations, as specified in Clause 6 [Publicity and Public Relations] to this Employer's Requirements, and furnish all information as required and as consulted by the employer.

3.1.11 The Contractor shall submit plans, programmes, reports, manuals and drawing as specified in Clause 3.10 of [Document Submission] of this Employer's Requirements for the five design stages in accordance with the provisions herein and as further detailed in Clauses 4.4 and 4.5 of Employer's Requirements -- Particular Specification to the Engineer for consent and issue of Notices of No Objection. It shall also include the additional information as required by the Engineer and / or required for co-ordination of the design of Other Contractors.

3.1.12 The Engineer will review the submissions to be satisfied that the submittal covers the obligations and intended purpose of the design of the Works and fully complies with the Contract.

3.1.13 A conceptual flow of the Design Stages and their relationship with the Design and Construction Phases are illustrated below: (Refer clauses 4.4 and 4.5 of Employer's Requirements - Particular Specification)

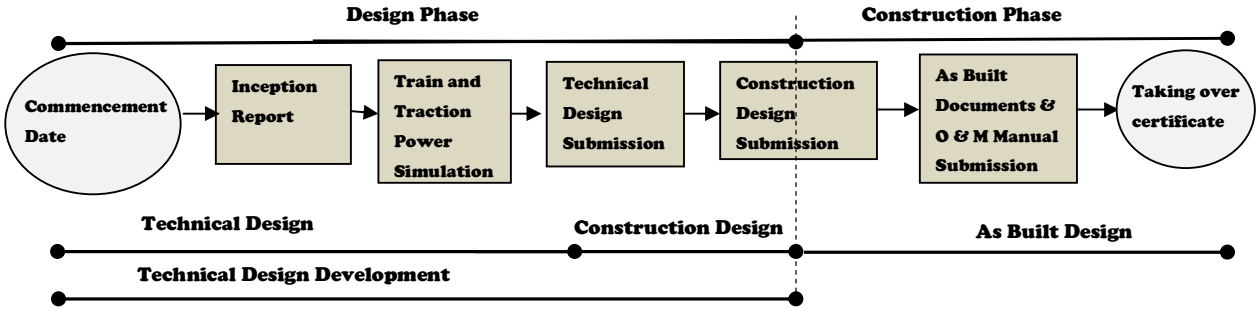

Fig – 1 Design Submissions

3.1.14 The Designs shall be submitted within the specified dates summarized in Clause 3.10 [Document Submission] of this Employer's Requirements as per the Design Submission Programme consented by the Engineer.

3.1.15 The Design of the Works shall be carried out in accordance with the Design Criteria as specified in Specifications Volume III (PS) of the [Bid documents], Project Quality Assurance Plan as described in Employer's Requirements – General and Clause 1.11 [Quality Assurance Requirements] to this Employer's Requirements.

3.1.16 All drawings and documents shall be produced and submitted in accordance with the requirements described in Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification.

3.1.17 Design submissions including Basic Designs, Construction Design, As-Built Documents shall include a valid "Design Certificate" as specified in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements, duly signed by the Chief Design Engineer of the Contactor's Design Team and Contractor's Representative thereby demonstrating that the Contractor has carried out and fully checked the design as being compliant with the Design Criteria, all quality assurance procedures and fully compliant with the requirements of the Contract.

3.2 Contractor's Organization during Design Phase

3.2.1 Project Organization Plan

(a) The Contractor's Personnel shall be deployed as described in Clause 6.9 [Contractor's Personnel] and Clause 6.10 [Records of Contractor's Personnel and Equipment] in the Conditions of Contract.

(b) Within 42 days after the Commencement Date, the Contractor shall submit the Project Organization Plan which includes complete project organization chart during the Design Phase, equipped with the functions in a manner as described in Clause 1.11 [Quality Assurance Requirements] to this Employer's Requirements. The Contractor shall deploy fully qualified personnel in the Design Team with the Engineer's consent for each key personnel during the Design Phase. This plan shall be updated and resubmitted whenever there are changes to the personnel. The Plan shall show the management structure and state clearly the duties, responsibilities and authority of each key and staff member.

(c) The Contractor shall establish the Design Team in his organization independent of the Construction Team, which shall be also maintained in the construction phase to ensure that the Contractor's design development strictly complies with the Technical Design which has received 'Notice of No Objection' from Engineer and also the Employer's Requirements and Specifications without being harmed by the adverse position of the Contractor against the Employer as detailed in clause 1.11 [Quality Assurance] of this Employer's Requirements.

3.3 Requirements during Design Phase

3.3.1 Review of Indicative Design included in Employer's Drawings
The Contractor shall review the indicative General Arrangement and other Drawings and suggest his modifications and improvements based on site conditions and as a result of the Traffic/ traction simulation exercise conducted by him and approved by the Employer.

3.3.2 Inception Report

(a) Within 98 days after the Commencement Date, the Contractor shall submit the Inception Report as described herein and as further detailed in Clauses 4.4 and 4.5 of Employer's Requirements - Particular Specification to the Engineer for consent and issue of a Notice of No Objection for submission of the train and traction Simulation Report.

(b) The Inception Report and the Train and Traction Simulation Report shall be based on the Contractor's Bid Design and the transportation requirement of the route as specified. The Contractor shall suggest the System Design and develop it sufficiently to provide the detailed main documentation needed to prepare and to develop the Technical Design and to demonstrate compliance with design requirements, including, but not limited to, survey, investigation plans, design submission plan and programme, reviews of the Employer's Documents. This Report shall sufficiently define the main component equipment, structures, and conductors for OHE and its components, traction power supply equipment, buildings required for housing the equipment and SCADA services etc. Full details of the contents of the Inception Report are given in Clauses 4.4 and 4.5 of Employer's Requirements - Particular Specification and the submittals are summarized in Clause 3.10 of [Document Submission] of this Employer's Requirements.

(c) In addition, general construction, manufacture, installation, testing and commissioning methodologies and documentation required to develop the Technical Design shall be submitted.

3.3.3 Technical Design

(a) Based on the Contractor's Bid Design and Technical proposals, and supplemented by the Inception Report as consented by the Engineer, the design of the Works shall be fully developed and detailed to the Technical Design by the Contractor. The Technical Design shall be prepared in accordance with the requirements of Specifications including Design Criteria included therein, Codes, Standards and Manuals as applicable on Indian Railways and applicable regulations/legislation in India and existing international norms/standards wherever required. The developed and updated drawings and documents shall be submitted in the Technical Design Submission to the Engineer for consent and issue of a Notice of No Objection.

(b) During the preparation of the Technical Design, the Contractor shall in particular:

(i) complete all calculations and analysis;

(ii) delineate all main and all other significant elements;

(iii) complete selection of materials and equipment and conduct all tests including specifications and type and other tests and trials.

(iv) assess and take full account of the effect on the Works of the proposed methods of construction, installation, testing and commissioning and temporary works.

(v) complete the validation of all the data provided by the Employer including all the additional surveys, investigations and testing as considered necessary by the Contractor to develop the Technical Design of the Works in accordance with the Contract.

(vi) draw up a set of the Technical Drawings as summarized in clause 3.10 of [Requirements for Submission of Documents and Drawings] of Employer's Requirements -- Particular Specification

(c) Engineering studies and comparative evaluations shall be performed to ensure that the designs incorporate features to achieve optimum performance in consonance with economy of all elements.

(d) The Technical Design shall include the Technical Drawings, the Works Specification, the Technical Design Report, the Construction Method Statement and all other contents of the Technical Design Submittals as summarized in clause 3.10 of [Requirements for Submission of Documents and Drawings] of Employer's Requirements -- Particular Specification and detailed in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification.

(e) The Contractor shall divide the Works into Works Segments in accordance with the "Definition of Works Segments" given in Clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements - Particular Specification and shall identify the Works Segments in the Works Programme and the Design Submission Programme.

(f) Upon issue of the "Notice of No Objection" in respect of the Technical Design Report, the Contractor shall complete the design in all respects and produce Technical Drawings.

(g) The Temporary Works as defined in Clauses 4.3 of [Temporary Works] of this Specification to the Employer's Requirements shall also be identified as a separate

Works Segment and the design of those shall be proposed by the Contractor early enough to have sufficient discussions on Engineering and procedural issues with the Engineer so as to meet the intent of the Employer's Requirements. The Contractor shall submit the agreed design of the Temporary Works as part of the Technical Design to the Engineer for consent.

(h) The Contractor shall further sub-divide the Technical Design of the Works Segment into Design Packages for submission and the sub-division shall be identified in the Design Submission Programme. The Design Packages are to relate to clearly identifiable parts and shall address the design requirements as described herein. The Design Packages shall facilitate the review and understanding of the Technical Design as a whole and shall be produced and submitted in an orderly, sequential and progressive manner to suit the construction sequence and the Works Programme.

(i) The issue of separate Notices for such sub-division shall be conditional upon the Contractor having demonstrated, to the satisfaction of the Engineer, the adequacy of the ratings of the equipment and conductors, safety of all structures and their suitability entailing all load permanent and temporary loadings .and that also its effects on other Contracts for the whole Works Segment has been fully accommodated in the Technical Design Package to ensure reliable and safe operations of the completed Railway System.

(j) Upon completion of Internal Authorization Process, as specified in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements, the Contractor shall submit the Technical Design as described herein, and as detailed in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements - Particular Specification, to the Engineer for consent and issue of a "Notice of No Objection".

(k) The Contractor shall provide to the Engineer two original full and latest editions of the publications / Technical Standards including the Codes and Standards and other documents that the Contractor propose to use for carrying out the Technical Designs, including other communications between Engineer and the Contractor relevant to this Contract as part of the Inception Report. These publications / documents shall be for the sole use of the Engineer and, upon completion of the Contract, shall become the property of the Employer

3.3.4 **Design Manual**

Soon after finalization of rating of components and preparation of Employment schedules required of the Construction Drawings, the contractor shall commence preparation of Design Manual to enable review of the design of the Works by the Employer's design checking organization. The Contractor shall continue to develop on this document during the course of the Design Phase. First submission of the Manual shall be on finalization of the basic Designs.

Further details are furnished in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification

3.4 Requirements during Construction Phase

The principal requirements during the Construction Phase are the production, submission and consent of the Construction Design, the As-Built Documents and the O&M Manuals.

3.4.1 Construction Design

(a) Upon the issue of a Notice of "No Objection" in respect of a Technical Design Package, the Contractor shall produce the respective Construction Design Package

which shall include, but not limited to,

(i) the Technical Drawings,

(ii) the updated Works Specifications including Method Statements/ work procedures/ construction sequences,

(iii) the Working Drawings

(iv) the Construction Documents including site sketches, fabrication and shop drawings, erection plan and sequences etc. and

(v) Works Management Plans as detailed in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification.

They shall be endorsed by the Contractor through the Contractor's Internal Authorizing Process as being in accordance with the Technical Design for which the Contractor has received the "Notice of No Objection"

(b) The Construction Design and Construction Technical Drawings including updated Works Specifications/ Method Statements etc. shall be derived directly from the Technical Design as approved by the Engineer including changes that may be necessary to resolve the comments of the Engineer attached to the Notice of No Objection.

(c) The Working Drawings and the Construction Practicing Documents shall be prepared to facilitate construction to meet the required workmanship as well as technical requirements. The Works Management Plans shall be prepared to check and monitor the Works in terms of SHE requirements described in Project SHE Manual detailed in this specification as Appendix 2 and Quality Assurance requirement described in clause 1.11 [Quality Assurance] The submittals are summarized in Clause 3.10 of [Requirements for Submission of Documents and Drawings] Employer's Requirements -- Particular Specification

(d) All those drawings and documents are revised, upgraded, detailed and integrated in the Construction Design Package. The Contractor shall fully verify the Construction Design Package through the Internal Authorization Process along with Design Certificate as described in Clause 1.11 [Quality Assurance Requirements] Employer's Requirements of this Specification by endorsing the original paper drawings and documents.

(e) Upon the Internal Authorization Process, as specified in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements, the Contractor shall submit the Construction Design Package as the "Request for Construction" as further detailed in clause 4.4 of [Requirements for Design] Employer's Requirements -- Particular Specification, to the Engineer for consent and issue of a Notice of No Objection.

(f) Upon receipt of the "Notice of No Objection" or "Notice of No Objection With Comments", the Contractor shall endorse the original paper drawings in respect of the Working Drawings as "Good For Construction" as per the Internal Authorization Process as defined in the Design Quality Assurance Plan as per clause 1.11 [Quality Assurance] of this specification. If the Engineer so requires, the said endorsed original paper drawings shall be re-submitted to the Engineer, who shall, if has no objection to the contents of the re-submission, further endorse the original paper drawings by stating that he has no objection to the proposed Working Drawings. On endorsement by the Engineer, the original drawings will forthwith be returned to the Contractor as Working Drawings to be issued to Site.

(g) The Construction Technical Drawings and the Working Drawings shall be used for construction purposes and only those drawings and documents that have been endorsed and certified through the procedure and have received "Notice of No

Objection" as above or those that the Engineer has expressly stated as not requiring his endorsement shall be issued to the Site.

(h) The Construction of the Works shall be strictly in accordance with the Construction Design Package, for which "Notice of No Objection" has been issued by the Engineer and "Good For Construction" drawings has been issued as per the authorization process detailed as above.

(i) The Construction Design Package may be divided into multiple submissions for different Work Segments (as defined in clause 4.4 [Basic Design Philosophy and Requirements for Design] of of Employer's Requirements -- Particular Specification and as consented by the Engineer. In such a case:

(i) Construction Design and Drawings in respect of each structure in a Work Segment shall be submitted for the entire structure

(ii) Submittals which are commonly applicable to the subsequent submissions shall be submitted in the initial submission and each submission shall include correlated and interdependent submittals.

All the divided Construction Design Submissions shall be integrated and compiled into one package at the time when the final submission is made as the Construction Design Package.

(j) If the Contractor identifies the need for any change to the design due to site conditions or any other reason, then the Contractor shall produce a Design Change Notice or Field Change Notice in accordance with procedures described in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification.

(k) The Contractor shall submit the Construction Design and Drawings for a particular work to the Engineer at least 3 months but not more than 6 months prior to the planned / scheduled date of commencement of that particular work.

3.5 As-Built Documents

3.5.1 The Contractor shall maintain all records necessary for the preparation of the As-Built Documents. The Contractor shall prepare and submit the As-Built Drawings and the Records which, subject to the Engineer's agreement, shall become the contents of the As-Built Documents. The Records are defined and detailed in Chapter 9 of [Requirements for Construction] of this Employer's Requirements.

3.5.2 The As-Built Drawings shall be a full set of the latest revisions of the Construction Technical Drawings, which are updated to incorporate all Design Change Notices and Field Change Notices and as many Working Drawings as necessary to convey a full and true record of the as-built condition of the Works. The As-Built Drawings shall show all changes from the Construction Design, all construction deviations and all other features relevant to the future maintenance and management of the Railway and it's facilities. The As-Built Drawings shall be endorsed by the Contractor as true records of the construction of the Works.

3.5.3 The As-Built Records shall include the recorded photographs as being consistent to Clause 4.21 [Progress Reports] in the Conditions of Contract.

3.5.4 The As-Built Records shall include documents as detailed in clauses 4.4 [Basic Design Philosophy and Requirements for Design] of and 4.5 of [Design Submission Requirements] Employer's Requirements -- Particular Specification and shall be verified and endorsed by the Contractor through the Internal Authorization Process, as specified in clause 1.11 [Quality Assurance] of this Employer's Requirements, as true records of the construction of

the Works.

3.5.5 As part of the As Built Documents, the Contractor shall maintain all records necessary for the financial completion and commissioning of the project. These records shall consist of as a minimum but not limited to the following:

(a) The implemented work according to activities, places and price

(b) Used Material – type, name of manufacturers along with batch number, place and price etc.

(c) Any other record as required by the Engineer / Employer

3.5.6 In addition to the Design Manual, the Operation and Maintenance Manuals (O&M Manuals) shall be included as part of the As-Built Documents. O&M Manuals are generally prepared for the Employer's operation and for the other contractor's works and shall include, but not limited to, the O&M Manual for each Traction Installation Equipment, The traction Overhead Equipment, the Instrumentation, Relaying and interlocking & SCADA and any other item essential to provide reliability and availability. Requirements for the Operation and Maintenance Manuals (O&M Manuals) are further detailed in the Employer's Requirements – Manufacturing, Installation, Testing and Commissioning.

3.5.7 The As-Built Documents shall be submitted to the Engineer for consent and issue of a "Notice of No Objection" at no extra cost to the Employer.

3.5.8 All the As Built Drawings and Records shall be submitted prior to the commencement of the Trial Runs. O&M Manuals shall be submitted within the period specified in the Employer's Requirements – Manufacturing, Installation, Testing and Commissioning in accordance with the Specifications and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Works. If as a result of tests and trials the "As built Drawings" need to be revised, these shall be also carried out at no extra cost. The Work shall not be considered to be completed for the purposes of issue of "Taking Over Certificate" until these documents and manuals have been submitted and accepted by the Engineer.

3.6 Contractor's Coordination with others

3.6.1 Other Contractors

(a) The Contractor shall fully coordinate the design of the Works with the design of the Other Contractors and shall follow the interfacing requirements as stipulated in Clause 4.6 [Co-operation] of the Conditions of Contract and as further detailed in Chapter 17 of the Particular Specification to the Employer's Requirements.

(b) Those Works, which are required to be executed by the Other Contractors, shall be fully coordinated and integrated and shall be provided throughout the Technical Design development and the results shall be recorded and summarized in the Combined Service Drawings(CSD) and the Interface Report on Other Contractors as part of the Technical Design and the Construction Design.

3.6.2 External Related Parties

The Contractor shall fully coordinate the design of the Works with all relevant bodies and entities, in particular government authorities, departments and regulatory bodies, public utility companies, Power Supply Authorities adjacent Indian Railway Authorities and the consultants, and contractors of adjacent projects whether ongoing or planned, as advised by the Engineer. The Contractor shall identify all such related parties in his Interface Management Plan (IMP) and other relevant requirements detailed in Chapter 17 of the Particular Specification to the Employer's Requirements.

3.6.3 Co-ordination with Indian Railways

General arrangement of OHE layout and their Technical Design proposed by the Contractor in respect of those in vicinity of the existing structures of Indian Railways shall also require approval from Indian Railways through Employer in addition to the consent by the Engineer.

The Contractor shall be required to submit one additional copy of all his GADs / span arrangement and Technical Design of all such structures to the Engineer for onward submission to Indian Railways. The Employer shall co-ordinate seeking the approval from Indian Railways, however, the Contractor shall facilitate the Engineer / Employer in seeking the approval from Indian Railways including but not limited to providing clarifications / additional data, attending meetings etc. as required.

3.7 Design Review Procedures

3.7.1 General

(a) The designs for all five Design Stages shall be submitted for review and consent to the Engineer. The form and the procedures prepared in the Contract shall not release or remove the Contractor's responsibility for the design under the Contract as indicated in Clause 3.1 [Engineer's Responsibility and Authority] in the Conditions of Contract.

(b) The issue of a Notice of No Objection will be without prejudice to the issue of any future Notices.

(c) The Contractor shall, prior to the submission of the Technical Design, obtain all required and/or statutory approvals that relate to that submission and demonstrate that all required approvals have been obtained.

(d) Supplemental, supporting information to the design submission under review may be requested by the Engineer. The Contractor shall supply such information within the time specified by the Engineer.

(e) All submissions shall be accompanied by six (6) original copies of "Design Certificate" format which is appended as "Attachment QA-1" to the Clause 1.11 [Quality Assurance] of this Employer's Requirements, as part of the Internal Authorization Process.

3.8 Design Submissions

3.8.1 In the case of submissions subsequent to the Technical Design, the Design Data shall be in accordance with the Employer's Requirements and the Technical Design.

3.8.2 The Contractor shall submit to the Engineer all the Designs and relevant Design Data together with the Design Certificates, on or before the respective dates for submission shown on the Design Submission Programme or the Works Programme. In the event that a resubmission of Design / Design Data is required, such resubmission shall be made as soon as practicable after the receipt of the relevant statement of objections. All submissions of Design Data shall include the copies as stipulated in the Employer's Requirements.

3.8.3 Following receipt of a submission of Design and Design Data, the Engineer shall, within the period specified in Clause 3.10 [Documents Submission and Review Procedure] of this Employer's Requirements respond as per the procedure defined in the said clause and issue "Notice of No Objection" or "Notice of No Objection with 'A' Comments" or "Notice of Objection with Comments" as the case may be. The Contractor shall comply with the requirements accordingly as specified therein.

3.8.4 The issue of a Notice of No Objection in relation to any submission of Design shall be entirely without prejudice to the review of subsequent submissions of Design or to any subsequent request for a Contractor's Variation, and shall not bind the Engineer in any manner

whatsoever when deciding whether to accept or not to accept the issue.

3.9 Design Submission Programme

3.9.1 The Contractor shall prepare the Design Submission Programme (for Design Phase and Construction Phase) which is to set out fully the Contractor's anticipated programme for the preparation, submission by the Contractor and review of the Design Packages, the issue of Notices by the Engineer for all stages of design. The Design Submission Programme shall cover all submissions during the Design Phase and the Construction Phase.

3.9.2 The Design Submission Programme shall:

(a) be deemed to comprise part of the Contractual Construction Programme and be in any case consistent and comply with all relevant Coordination Dates in the latest Contractual Construction Programme;

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

(c) make adequate allowance for periods of time for review by the Engineer as specified in Clause 3.9 of [Documents Submission and Review Procedure] Employer's Requirements -- Particular Specification and for the review of other bodies, if necessary;

(d) clarify correlations by identifying, describing, cross-referencing and explaining the various Design Submissions including multiple submissions of the design for the different Work Segments;

(e) make adequate allowance for the design and development of the specialist works /sub-contractor works

(f) indicate the interfacing design activities in respect of each of the other contractor / Interfacing Parties and external related parties and

(g) Shall meet the requirements as specified in Clause 3.10 of [Requirements for Submission of Documents and Drawings] Employer's Requirements -- Particular Specification

3.9.3 The Contractor shall submit the Design Submission Programme to the Engineer within sixty days (60) after the Commencement Date, and thereafter up-dated versions thereof at intervals of not more than one (1) month throughout the Design Phase. Such updates shall be included as an exhibit in the Contractor's Monthly Progress Report.

3.9.4 The Contractor shall submit complete set of documents requested by any Indian legislation, as well as approved As Built Documents and certificates for conclusion of any legislative procedures

3.9.5 General requirements which are applicable to the Design Submission Programme are described in Clause 1.8 of [Project Programme Requirements] of this Employer's Requirements.

3.10 Document Submission

3.10.1 The Contractor's Technical Proposals shall be amplified during the design stages (Inception Report, Train and Traction Power Simulation Report, Technical Design and Construction Design). The following process of document submission shall be generally followed:

(a) The Contractor shall submit drawings and documents, as required by the Contract, to the Engineer in accordance with the Design Submission Programme meeting the requirements as specified in Clauses 4.4 [Basic Design Philosophy and Requirements for Design] and 4.5 [Design Submission Requirements] of Employer's Requirements -- Particular Specification.

(b) The Construction Design submittals shall be made sufficiently before the Works are to be carried out to give the Engineer reasonable time to examine the drawings or other documents and to prepare comments within the response time.

(c) Where the consent / Notice of No Objection from the Engineer is required, the Engineer shall notify the Contractor in writing of his decision within stipulated time.

(d) If the Engineer has reasonable cause for being dissatisfied with the submissions made by the Contractor, the Engineer shall require the Contractor in writing to make such amendments thereto as the Engineer may consider necessary. The Contractor shall make and be bound by such amendments at no additional expense to the Employer and shall resubmit the amended documents for Engineer's consent.

(e) Within 7 days of notification of the Engineer's consent / "Notice of No Objection" or "Notice of No Objection with Comments", the Contractor shall provide the Engineer with the type and numbers of sets of the relevant drawings and / or documents as stipulated in the Employer's Requirements for further execution of the process.

(f) Should it be found at any time after notification of consent / "Notice of No Objection" / "Notice of No objection with Comments" (as the case may be) that the relevant drawings or documents do not comply with the Contract or do not agree with drawings or documents in relation to which the Engineer has previously notified his consent / "Notice of No Objection" / "Notice of No objection with Comments" (as the case may be), the Contractor shall, at his own expense, make such alterations or additions as, in the opinion of the Engineer, are necessary to remedy such non-compliance or non-agreement and shall submit all such varied or amended drawings or documents for the consent of the Engineer.

(g) Errors, omissions, ambiguities, inconsistencies, inadequacies and other defects shall be rectified by the Contractor at his own cost and the acceptance by the Engineer of the Manufacture and Construction Documents shall not amount to any waiver and shall not relieve the Contractor of his obligations under the Contract.

(h) No examination by the Engineer of the drawings and / or documents submitted by the Contractor, nor any consent / "Notice of No Objection" / "Notice of No objection with Comments" (as the case may be) of the Engineer in relation to the same, with or without amendment, shall absolve the Contractor from any of his obligations under the Contract or any liability for or arising from such drawings or documents.

3.11 Calculations

3.11.1 Unless otherwise required by the Engineer, calculations shall be submitted together with the respective Design Package submissions.

3.11.2 A comprehensive set of calculations for the whole of the Technical Design, commencing from the input and output data to the Train and traction Power Simulation Programme, basic Designs, the Construction Design and Technical Drawings / Working Drawings (in the form acceptable to the Engineer) shall be submitted by the Contractor to the Engineer for consent as part of the relevant submittals.

3.11.3 Should the design of the Works be revised thereafter and such revision render the submitted calculations superseded, then the Contractor shall prepare and submit revised calculations at the same time the revised design is submitted.

3.11.4 The Engineer shall require the Contractor to submit and install one copy all the applicable software as used by the Contractor for the Design, including the train and traction Power Simulation Computer Programme duly licensed in the name of Employer and in accordance with Clause 1.14 of Employer's Requirements of this specification including in-house software programme / worksheets developed by the Contractor, computer input and programme logic prior to the acceptance of any computer output. The Contractor shall submit the same to the

Engineer without any additional cost.

3.11.5 The Contractor shall submit all calculations necessary to support proposals relating to the construction methods.

3.12 Contractor's Warranty of Design

3.12.1 The Contractor warrants that the Contractor's design (in accordance with Sub-Clause 4.1(Contractor's General Obligations) Conditions of Contract meets the Employer's Requirements and Specifications provided by the Employer and is fit for the purpose thereof. Where there is any inadequacy, insufficiency, impracticality or unsuitability in or of the Employer's Requirements and Specification or any part thereof, the Contractor's design shall take into account, address or rectify such inadequacy, insufficiency, impracticality or unsuitability at Contractor's own cost.

3.12.2 The Contractor shall indemnify the Employer against any damage, expense, liability, loss or claim, which the Employer might incur, sustain or be subject to arising from any breach of the Contractor's design responsibility and/or warranty set out in this clause.

3.12.3 The Contractor further specifies and is deemed to have checked and accepted full responsibility for the Contractor's part of the design (in accordance with Sub-Clause 4.1(Contractor's General Obligations) Conditions of Contract.

(a) Notwithstanding that such design may be or have been prepared, developed or issued by the Employer which has been checked by the Contractor, any of Contractor's consultants, his sub contractor's and/or his qualified personnel/persons or cause to be prepared, developed or issued by others.

(b) Notwithstanding any warranties, guaranties and/or indemnities that may be or may have been submitted by any other person.

(c) Notwithstanding that the same have been accepted by the Engineer.

3.12.4 The Contractor shall conform to the provision of any statute relating to the Works and regulation and bye-laws of any local authority and of any water and lighting agencies or undertakings, with whose system the work is proposed to be connected and shall before making any variation from the drawings or the specifications that may be necessitated by so confirming give to the Engineer notice specifying the variation proposed to be made and the reason for making the variation and shall not carry out such variation until he has received instructions from the Engineer in respect thereof. The Contractor shall be bound to give all notices required by statute, regulations or bye-laws as aforesaid and shall pay all fees and taxes payable to any authority in respect thereof. Nothing shall be payable by the Employer in this regard.

3.12.5 The Contractor shall ensure compliance of provision of all laws of land in force and enacted from time to time and:

(a) Ensure compliance of the regulations or bye-laws of any local body and utilities.

(b) The Contractor shall arrange necessary clearances and approvals before the work is taken up. Nothing extra will be paid by Employer on this account.

(c) Ignorance of rules, regulations and bye-laws shall not constitute a basis for any claim at any stage of work.

3.12.6 The Design Warranty shall be submitted by the Contractor as part of the Inception Report and shall be as per the format included in Volume 1 of the Bid Documents.

3.13 Traction Power Installation and SCADA Planning Report

3.13.1 Based on the requirements for each facilities indicated in the Employer's Drawings attached in Volume V [Employer's Drawing] in this Contract Package, the Contractor shall review the contents of the Employer's Drawings and outline the basic characteristics of his Equipment Installation Report of each Installation Works Segment of the Traction Power Supply installation which comprise of Traction Substations, Sub-sectioning Posts, the Sectioning posts and the Autotransformer Stations, their protection and interlocking, the SCADA and the System Operation as indicated in the related Clauses of Vol. III

3.13.2 The Contractor shall submit the Traction Power Supply Planning Report to the Engineer for review as part of Inception Report as summarized in Clauses 4.4 [Basic Design Philosophy and Requirements for Design] and 4.5 [Design Submission Requirements] of Employer's Requirements -- Particular Specification.

3.14 Traction Overhead Equipment Work Installation Planning Report

3.14.1 Based on the requirements for each facilities indicated in the Employer's Drawings attached in Volume IV [Employer's Drawing] in this Contract Package, the Contractor shall review the contents of the Employer's Drawings and outline the basic characteristics of his Equipment Installation Report of each Installation Works Segment of the Traction Overhead Equipment Report and the Final Alignment included in the Employer's Drawings (Volume V of the Bid Documents), the Contractor shall review the contents of the same and outline the basic characteristics of the Traction OHE Work planning including manufacturing, commissioning and testing of materials to be used and OHE installation procedures in the Installation Planning Report.

3.14.2 The Contractor shall submit the Traction Over Head Equipment Work Installation Planning Report to the Engineer for review as part of Inception Report as summarized in Clauses 4.4 [Basic Design Philosophy and Requirements for Design] and 4.5 [Design Submission Requirements] of Employer's Requirements -- Particular Specification.

3.15 Document Format Requirement

3.15.1 Detailed requirements regarding the number of copies of drawings and documents and their standards required for submissions, the acceptable file formats and content formats are given in Clause 1.10.1 of [CAD and Document Standards] of this Employer's Requirements. After receipt of "Notice of No Objection" from the Engineer, the Contractor shall submit six (6) copies of the Design and / or Drawings for the use of the Engineer.

END OF CHAPTER

4 CONSTRUCTION REQUIREMENT

4.1 Contractor's Responsibilities

4.1.1 The Contractor shall take full responsibility for adequacy, stability, safety and security in respect of all the works irrespective of any approval / consent by the Engineer. These include but are not limited to :

(a) All the Installation provided as part of the Works including the Permanent Works and Temporary Works;

(b) Site Operations;

(c) Methods of construction, manufacture, transportation, installation including testing

and commissioning;

(d) Plants and Machinery;

(e) Contractor's Equipment;

4.1.2 The Contractor shall, whenever required by the Engineer, submit to the Engineer details of the arrangements and methods which the Contractor proposes to adopt for execution of the Works for his consent. No alteration to these arrangements and methods shall be made without the consent of the Engineer.

4.1.3 .

4.1.4 All the other operational assets of Indian Railways (IR) existing within the Right of Way shall be re-located by IR. However where such works are not complete, necessary precautions shall be taken by the Contractor as acceptable to Engineer and IR.

4.2 Contractor's Organization during Construction Phase

4.2.1 Project Organization Plan

(a) The Contractor's Personnel shall be deployed and records maintained as described in Clause 6.9 [Contractor's Personnel] and Clause 6.10 [Records of Contractor's Personnel and Equipment] of the Conditions of Contract. The Contractor's Superintendence shall be also properly deployed and maintained to carry out the construction activities as described in Clause 6.8 [Contractor's Superintendence] in the Conditions of Contract.

(b) The Contractor shall submit an updated Project Organization Plan which includes complete project organization chart during the Construction Phase adding functions and personnel necessary to perform the Works during the Construction Phase in accordance with the Conditions of Contract. This plan shall be updated and resubmitted whenever there are changes to the staff and / or the organizational structure. The plan shall show the management structure and state clearly the duties, responsibilities and authority of key staff member.

(c) The Contractor's Representative and his associates, staff, supervisors shall have the experience and qualification appropriate to the type and magnitude of the works. They shall be efficient and competitive enough to give necessary directions to their workers for execution of the works in safe and proper manner. Full details regarding qualification and experience in respect of all the key staff shall be submitted to the Engineer for his consent. As per Clause 6.9 [Contractor's Personnel] of Conditions of Contract, If the Engineer asks (in writing) the Contractor to remove a person of his work force stating the reasons, the Contractor shall ensure that the person leaves the Work Area within seven days and shall have no further connection with the Works in the Contract. The Engineer shall also seek consent of the Employer in this regard

(d) During the Construction Phase, the Contractor shall maintain the Design Team in his organization independent of the Construction Team to deal with his design development including the Variation and changes to his design as is performed through the Design Changes and Variation Procedure as described in clause 4.4 [Basic Design Philosophy and Requirements for Design] of Employer's Requirements -- Particular Specification and as described in Clause 13.3 [Variation Procedure] in the General Conditions of Contract under the Contract.

4.2.2 Requirements During Construction Phase

(a) The principal requirements relating to the Contractor's Documents during the

Construction Phase are the submissions by the Contractor of the followings :

(i) Working Drawings and Documents,

(ii) the technical submissions as required under the Contract,

(iii) the compilation of the multiple design submissions for the different Work Segments and submission of the final design with related documentation and the submission of the As-Built Drawings / Document.

(b) Working Drawings and Documents shall be prepared as required under the Contract.

(c) The Contractor shall endorse the Working Drawings and Documents as being in accordance with the Technical Drawings which have received "Notice of No Objection" or "Notice of No Objection with Comments" from the Engineer after the comments duly resolved.

(d) The Contractor shall endorse the submissions required under the contract that "all effects of the designs comprising the submission, on the design of adjacent or other parts of the works have been fully taken into account in the design of these parts".

(e) The Contractor shall maintain all records necessary for the preparation of the As-Built Drawings and Documents.

(f) Upon completion of the Works or at such time as agreed to or required by the Engineer, the Contractor shall prepare drawings which, subject to the Engineer's agreement, shall become the As-Built Drawings and Final Documents.

(g) All such drawings and documents shall be endorsed by the Contractor as true records of the construction of the Permanent Works and of all Temporary Works that are to remain on the site.

(h) The Contractor shall maintain all records necessary for the physical and financial completion and commissioning. These records shall consist of as a minimum:

(i) The implemented work according to activities, places and price; and

(ii) Used materials – type, name of manufacturer along with batch No., place & price etc.

Such records shall form part of As Built Drawings.

(i) Prior to the commencement of construction operations, the Contractor shall obtain all necessary clearances from the concerned Authorities.

(j) Contractor shall take all measures and precautions to ensure that the construction activities do not cause any infringement to the operations and maintenance of Indian Railways. Any construction activity involving the existing embankment/formation of the Indian Railways shall be permitted only with specific authorization by the Engineer with the approval from Employer and Indian Railways.

4.2.3 Foundation Work

Prior to start of the construction operations, the Contractor shall submit all relevant technical details including but not limited to the following for review and evaluating the proposed construction methods and quality control procedures.

(a) Geological Investigation Report and evaluation of sub-surface conditions for Permanent Works along the Final alignment and on the site of TSS and Supply Control Posts (SP, SSP and Auto Transformer).

(b) Details of construction equipment

(c) Construction quality control plan

4.2.4 Availability of Fill Material for building up the level of the ground for the TSS, SP, SSP and AT stations.

4.2.5 The Contractor shall procure the materials suitable for the fill required after carrying out the necessary tests as approved by the Engineer. The top rubble fill of the TSS shall be of material approved by the Engineer.

4.3 TEMPORARY WORKS

4.3.1 All necessary Temporary Works adequate for the realization of the Works such as Temporary Facilities and Temporary Utility Services shall be provided and maintained by the Contractor for his own use, for his sub-contractors, the Engineer and the Employer unless otherwise authorized by the Engineer.

4.3.2 The Temporary Facilities including, but not limited to, offices, warehouses and material stock areas as well as the Temporary Utility Services including, but not limited to, power, lighting, water and communication shall be provided, equipped, and maintained in good conditions until the issue of Taking-Over Certificate.

4.3.3 The Contractor shall ensure that the Temporary Facilities and Services do not interfere with the Permanent Works or prevent the installation, commissioning and testing of the Permanent Works and works and services of Other Contractors. The Contractor may locate his Temporary Facilities - in the Right of Way (ROW) or on Contiguous land acquired for SP, or SSPs within the land earmarked for the purpose upon approval of the Engineer.

4.3.4 All the requirements and provisions as specified in Appendix 2 Project SHE Manual of this Employer's Requirements shall be complied with.

4.3.5 **Submittals**

(1) Technical Design Submission

The contractor shall submit the Temporary Works Drawings and the Temporary Works Design Report which detail adequate scale, location and all arrangements of the Temporary Works to the Engineer for review within 120 days after the Commencement Date except for the items as described in para 4.3.5 (4), (7) and (8) and para 4.3.6 herein below, submissions in respect of the same may be made by the time when the Final Technical Design Submission is made.

(2) The Temporary Works to be carried out shall be consistent with the plan submitted by the Contractor with his technical proposal in his Bid together with any subsequent developments and / or changes subsequently agreed to by the Employer / Engineer. The Temporary Works shall include but not limited to the following:

(a) Engineer and Employees' camp:

Detailed drawings at scale 1:500 showing the camp layout, buildings, roads, recreation areas, all public utilities, etc., and drawings at scale 1:50 showing typical building construction details with specifications

(b) Offices, parking areas, warehouses, storage areas, and medical care services:

Drawings and specifications for the establishments and facilities with appropriate details and First Aid Station as detailed in Appendix 2 of General Specifications vol. II Project SHE Manual to this Employer's Requirements.

(3) Water supply, sewerage, sewage treatment and disposal, power supply and illumination, communication services (basically mobile phones and land phones), and firefighting services

(a) Detailed design for industrial and potable water supply to the camps and working areas as well as sewerage systems, sewage treatment and disposal system based upon estimated number of users in compliance with the SHE requiems given in Appendix 2 Project SHE Manual of this Employer's Requirements.

(b) Detailed layout drawings for electrical installations and distribution system at the Site and Work Areas, showing power sources, voltages, outlets, and routing of power lines

Equipment pools and structural yards and workshops

(4) Transporting, handling and erection system for OHE Masts, steel fabricated elements including design and drawings for launching truss / girder etc.

(5) Material testing laboratories

Detailed breakdown of all equipment to be used for material testing in field and in laboratories in accordance with the requirements of the pertinent provisions of the Specifications.

(6) Security and safety arrangementsLayout and drawings for offices for the Employer's and the Engineer's staff.

(7) Project sign boards and diversion boards

(8) Barricades and other temporary walls and alike with pertinent design considerations & drawings containing details such as height, material, colour scheme, Logo, anchoring mechanism etc. complying the requirements specified in Appendix 2 Project SHE Manual of this Employer's Requirements.

All arrangements shall comply with the relevant provisions prepared in this Employer's Requirements

4.3.6 Temporary Facilities for the Contractor's Use
Contractor's Site Offices, Warehouses, Material Yards

(1) The Contractor shall provide and equip, for his own and his subcontractors' use, main and secondary offices, warehouses, materials stock areas, Security storage areas for high value items, all of which shall be constructed and furnished for use within 140 days after the Commencement Date and maintained in good conditions until the issue of Taking-Over Certificate.

(2) Listed hereunder are the buildings, shops and warehouses expected to be constructed and equipped by the Contractor for his use in the performance of the Work under this Contract, in addition to facilities explicitly specified elsewhere in this Contract:

(a) Steel assembly and fabrication shop.

(b) Electrical and mechanical repair shop, Test Facility and site laboratory

(c) Bracket and other SPS assembly and test shop.

(d) Main warehouse, Cement, component, and tools & parts stores

(e) Steel structure Storage area

(f) High Value Security storage Shed and area.

(g) Load Testing Facilities (mechanical load)

(h) Facility for Storage of Conductor Drums, fittings etc.

(i) Wiring train and other vehicles parking facilities

4.3.7 **Temporary Facilities for the Use by Employer and Engineer**
Site Office and Huts : Requirements

The Contractor shall design, construct, equip and furnish the site offices and huts for the Employer's and Engineer's use at the time specified below. The Contractor shall also maintain the site office and the huts in good condition and provide services including, but not limited to maintenance of the office equipment and furniture, repairing and mending, cleaning, consumable replenishment in respect of toiletries, cartridges for the plotter and colour laser writers, first aid box, batteries / battery cells, drinking water etc. Design of all the Site Offices and Huts shall be submitted to the Engineer for review prior to commencement of the construction of those facilities. Details of the Engineer's site office including a provisional site office and huts are described in the following paragraphs.

All furniture, furnishings, fittings & fixture and equipment etc. shall be of the configuration, make and quality as approved by the Engineer.

Unless otherwise stated herein below, all the site office and huts including all furniture, furnishings, fittings & fixture and equipment etc. as provided by the Contractor for the use of Engineer / Employer shall be the property of the Contractor after issue of Taking-over Certificate.

(1) Provisional Site Office

Within 120 days after the commencement date, a provisional site office shall be constructed and furnished and maintained in good condition for use while the main site office is being constructed.

(a) The provisional site office shall be constructed using the approved materials. They shall be capable of being dismantled but of sound, weatherproof construction and shall be provided with lockable doors and windows, mosquito screens, appropriate HVAC systems, mobile sanitary facilities, lighting power supplied by diesel generator unit(s).

(b) The provisional site office shall have internal partition walls and doors, and shall contain at least the following rooms:

Room Designation	Floor Area (m^2)
Resident Engineer	15
Principal Office	15
General Office	50
Meeting Room	50
Wash Rooms/Stores/ Miscellaneous with shelving	

as required	35
Total Area	165

(c) The furniture, furnishings, fittings & fixture and equipment etc. to be provided are listed in Table 3.7-2 at the end of this Section. This list is to be understood as a description of minimal requirements and may be expanded. All the said furniture, furnishings, fittings & fixtures and equipment as provided by the Contractor for the provisional site office may be shifted to the main site office and shall be adjusted against the quantities of furniture, furnishings, fittings & fixtures and equipment required for the main site office.

(2) Main Site Office

Within 180 days after the commencement date, unless otherwise authorized by the Engineer, the Engineer's main site office shall be constructed in the same junction station or crossing station as the Contractor constructs his own main office and fully furnished as described in the following clauses, and maintained in good conditions until the issue of taking-over certificate unless otherwise authorized by the Engineer.

(a) The area surrounding the office shall be well drained and provided with concreted pavements, walkways and parking areas for the vehicles.

(b) The main office buildings shall be of sound design and of the material as approved by the Engineer, complying with national building codes. The office shall be weatherproof, lined inside with plywood, and painted internally and externally. Floors shall be tiled and floor to ceiling height shall be as approved by the Engineer. Each room having an internal wall shall have at least one screened window. The office building shall have two external lockable doors with screened storm doors. Electricity supply and receptacles shall be provided in various locations appropriate to the usage of the rooms. Rooms shall be well lighted, appropriate HVAC systems with temperature control and other necessary building services as described in the National Building Code of India.

(c) The main site office shall be furnished as referred to the following parameters and the design shall be submitted to the Engineer for review.

Room No. and Designation	No. of Rooms	Min. Area (m^2)	Min. Tot. Area (m^2)
1. Project Manager Office, (PM, Secretary & Engineer)	1	30	
2. Dep. Proj. Manager (Dy. PM & Secretary)	1	15	15
3. Senior Engineers	1	50	50
4. Jr. Engrs./Surveyors	1	50	50
5. Inspectors	1	30	30
6. Conference Room	1	30	30
7. Administration Office	1	50	50
8. Filling Room	1	30	30
9. Store	1	50	50

10. Lobby/Display	1	15	15
11. Kitchenette	1	15	15
12. Washrooms	2	20	40
13. Printing Room	1	20	20
Total Area (Minimum)		660	**680**

(d) Plumbing fixtures shall be standard types made out of porcelain or stainless steel and all pipe work and fittings shall be polyvinyl chloride (PVC). All works, materials and fixtures shall comply with the national plumbing code, sanitary Engineering standards, and other applicable regulations.

(e) The equipment and furniture to be provided are listed in Table 3.7-1 at the end of this Appendix. This list is to be understood as a description of minimal requirements and may be expanded.

(3) Site Huts

(a) The Site Huts in all TSS locations shall be constructed in the same conditions and specifications except dimensions of the buildings as described those of the main site office above.

(b) Every site hut shall be furnished as referred to the following parameters and the design shall be submitted to the Engineer for review.

Room No. and Designation	No. of Rooms	Min. Area (m^2)	Min. Tot. Area
1. Engineers and Inspectors	1	25	25
2. Conference Room	1	15	15
4. Kitchenette	1	5	5
5. Washrooms	1	5	5
Total Area (Minimum)			50

(c) The furniture, furnishings, fittings & fixture and equipment etc. to be provided are listed in Table 4.3-1 & 4.3-2. This list is to be understood as a description of minimal requirements and may be expanded.

(4) Service Vehicles

(a) The Contractor shall provide, service vehicles along with drivers and maintain them for the exclusive use of the Employer and Engineer.

(b) Delivery of the said service vehicles shall commence within 120 days after the Commencement Date and the entire numbers of the vehicles shall be delivered as per the delivery schedule as advised by the Engineer. All the vehicles shall be maintained and serviced until the issue of Taking Over Certificate unless otherwise authorized by the Engineer.

(c) Service vehicles shall be supplied brand new, fully licensed and insured, and shall be replaced by new ones in case of repeated breakdowns. The requirement of vehicles will be four for each main site office and three each for provisional site offices.

(d) The Contractor shall also arrange to supply fuel, lubricants, spare parts, replace tires when necessary, and perform regular servicing and maintenance.

(e) The above vehicles shall be assigned full time to the Engineer until issue of Taking Over Certificate.

(f) In case of breakdown or if a vehicle is undergoing servicing, repair and maintenance, the a replacement with equivalent standard shall be provided immediately.

(g) The Contractor shall arrange to provide regular licensed drivers for all the vehicles to operate the vehicles under the complete supervision and control of the Engineer. The drivers shall be available both day and night and on all, working and non-working days.

(h) In the event that the drivers or the vehicles are not performing in a satisfactory manner, the Engineer will request their replacement and the Contractor shall comply immediately with such request to entire satisfaction of the Engineer. In case the Contractor fails to provide or promptly replace any of the specified vehicles or drivers, the Engineer shall arrange rental of an equivalent alternative at the risk and cost of the Contractor.

4.3.8 **Temporary Utility Services for the Use by Engineer and Employer**

4.3.8.1 The following temporary utility services shall be provided by the Contractor for the use by the Engineer / Employer until issue of Taking Over Certificate unless otherwise directed by the Engineer.

(1) Electricity and Water Supply

Power and potable water supply systems for the Engineer and Engineer's site offices (provisional site office, main site office and site huts) shall be installed and made operational within the specified period of construction as mentioned above in respect of the respective site offices The Contractor shall maintain and provide continuous and adequate supplies unless otherwise authorized by the Engineer.

(2) Sanitation and Sewerage

(a) Sanitation and Sewerage systems for the Employer and Engineer's site offices shall be installed and made operational within the specified period of construction as mentioned above in respect of the respective site offices.

(b) The Contractor shall provide a properly designed and constructed septic tank approved by the Engineer for the disposal of domestic sewage from each building in the Engineer's site offices / huts.

(c) Each septic tank shall be regularly emptied, maintained and serviced by the Contractor to ensure proper functioning.

(3) Office Cleaning, Waste and Garbage Disposal

(a) The Contractor shall provide personnel and perform daily cleaning of all rooms in the Employer and Engineer's site offices and huts.

(b) The Contractor shall collect and dispose of, in a location and manner approved by the Engineer, all domestic waste and garbage from the Employer's and Engineer's site offices and huts on daily basis. Collection times shall be arranged for the convenience of the Employer and Engineer.

(4) Use of Contractor's First Aid Stations

The Contractor's emergency medical care and first aid services shall be made available for use by the Employer's and Engineer's site staff and their families living at the Site or the Work Areas free of charge,

(5) Fire Fighting Equipment:

Firefighting equipment shall be provided in all the site offices and huts of the Engineer in accordance with the recommendations of the Local Fire Brigade Station.

(6) Office Security

The services of a full time round the clock office security shall be provided for all the site offices and huts of the Engineer.

Table 4.3-1

FIXTURES AND FURNISHINGS IN ENGINEER'S MAIN SITE OFFICE

Fixture/Furnishing	Number of items to be furnished
Executive desk (lockable) with drawer and chair	10
Desk (lockable) with drawer and chair	50
Secretarial desk (lockable) with drawer and chair	3
Reception desk (lockable) with drawer and chair	1
Side Table	10
Additional chairs	30
Plan table, adjustable w/lamp & stool	5
Conference Table	1 with 20 Chairs
Sofa set	3
Plan rack with holders	as one thinks fit
Drawing Hangers	as one thinks fit
Drawing Cabinets	10
Filing cabinet (4 drawer-lockable)	20
Steel cabinet (lockable)	20
Office safe (combination lock)	1
Book cabinet (glass fronted)	5
Wall shelving (set)	20
Window curtains (set)	as one thinks fit
Telephone unit with EPBX system	95 (number of phone sets)
Internet Connection	95 (number of outlets)
Fire extinguisher	2 nos
Wastepaper can	100
Color LaserWriter (FAX/Copier)	3
Plotter	1
Display boards (wall type)	10
Fully automatic camera with date and time recording facility downloadable to a PC	1
Multi-functional Movie projector (with screen)	1
First aid box	5
Refrigerator	2
Coffee percolator	2

Microwave Oven	2
Crockery/cutlery set	20 settings
Hot and cold drinking water dispenser	2
Sink unit with worktops and geyser	2
Water closet with stall	10
Lavatories	10
Urinals with flush	5
Wall mirror	8
Safety helmets (various sizes)	40
Rain coats (various sizes)	20
Industrial safety goggles	20
Pair safety boots (various sizes)	40
Flashlight with batteries.	40
Wall clock	4
Lockers	40
Safety High Glow Jackets	40
Safety Harness (full body)	20

Table 4.3-2

FIXTURES AND FURNISHINGS IN ENGINEER'S PROVISIONAL OFFICE AND SITE HUT

	Number of items to be furnished	
Fixture/Furnishing	**Provisional Office**	**Hut**
Desk (lockable) with drawer and chair	12	6
Additional office chairs	10	Nil
Side Tables	2	Nil
Conference table	1 with 20 chairs	1 (small with chairs)
Filing cabinet (4 drawer-lockable)	6	2
Drawing Cabinets	1	Nil
Steel cabinet (lockable)	4	2
Book Cabinet (glass fronted)	3	Nil
Window curtains (set)	as one thinks fit	
Telephone unit with EPBX system	12 (number of phone sets)	
Internet Connection	12	6
Fire extinguisher	2 nos	2 nos
Wastepaper can	12	6
Color LaserWriter (FAX/Copier)	1	1
Display boards (wall type)	2	2
Fully automatic camera with date and time recording facility downloadable to a PC	Nil	1
First aid box	1	1
Refrigerator	1	1
Microwave Oven	1	1
Crockery/cutlery set	5 sets	1 Set
Hot and cold drinking water dispenser	1	1
Coffee Percolator	1	1
Sink unit with worktops and geyser	1	1
Water closet with stall	3	1
Lavatories	3	1
Urinals with flush	2	1
Wall mirror	2	1
Safety helmets (various sizes)	10	6
Rain coats (various sizes)	5	6
Pair safety boots (various sizes)	12	6

Industrial safety goggles	12	6
Flashlight with batteries.	12	6
Wall clock	1	1
Drawings Hangers	Nil	as one thinks fit
Safety High Glow Jackets	Nil	6
Safety Harness (full body)	Nil	6

4.3.9 **Land for temporary facilities for Contractor's Use:**

The total area of land required for Temporary Works shall be made available to the Contractor by Employer. The Contractor shall be allowed to use this land for carrying out his Temporary Works including storage of Steel structures, components, conductors etc. and track sidings for stabling the construction train and other materials subject to the consent by the Engineer. Any land required in excess of that made available to him shall have to be arranged by the Contractor using his own resources and at his own cost under due intimation to the Engineer.

4.3.10 **Assembly of Components & Material Testing Facility**

(1) The Contractor shall build and equip adequate Assembly and Material Testing facility on the Site for the Work including that for concrete for foundations as required.

(2) The facility shall be located in a temporary building properly ventilated and equipped with electricity, water, and shall have enough room for all the activities.

(3) The Test Equipment and apparatus shall be calibrated before the testing starts and at regular intervals as specified by the manufacturer and as directed by the Engineer. The Contractor shall submit the results of the calibration to the Engineer regularly.

(4) The Contractor shall complete the construction and installation of the facility for operation at least 2 weeks prior to the stage of works where such facilities are required to be taken up and operate and maintain the facility until the issue of Taking-Over Certificate unless otherwise authorized by the Engineer. The Contractor shall also make all facilities and services available to the Engineer as required. All sampling and testing to be undertaken shall be under the direct supervision of the Engineer. The Material Testing Laboratory shall be run by Contractor's personnel fully experienced in sampling and testing of materials, and quality control.

4.3.11 **Communication Systems**

(1) The Communication System to be applied to the project shall be basically the Mobile Phone Base Communication System. The Contractor shall establish the Mobile Phone Base Communication System Plan solely dependent on ready-to-use mobile phones for internal and external communication and submit the plan to the Engineer for consent.

(2) The Contractor shall ensure that his Communication System is available for communication with the Engineer and Employer within 120 days after Commencement Date and shall maintain the same until completion of the Defect Notification Period.

4.3.12 **Employee's Camp**

(1) The Contractor shall provide adequate camping facilities for the use of his employees / staff and those of his sub-contractors. Camping facilities shall have adequate sanitary facilities including sewage disposal system, medical service, drainage, fire control and all utility services (potable water, power etc.) and shall comply with statutory requirements.

(2) Contractor's Employee's Camp may be located at the land available within the ROW at each Station identified for the Temporary Works and indicated on the Employer's Drawings. If any additional area is required by the Contractor for the purpose, the same shall have to be arranged by the Contractor at his own cost.

(3) No camp construction shall commence until the Contractor's drawings and specifications have been consented by the Engineer.

(4) Camp facilities shall be provided to meet the requirements of the maximum anticipated work load and labor force. These facilities shall be available and fully operational within 160 days after the Commencement Date and maintained in good conditions until the issue of Taking-Over Certificate unless otherwise authorized by the Engineer.

(5) The Contractor's Camp shall comply with the applicable laws, Codes and Standards.

(6) The Contractor shall be responsible for keeping the camp, and the buildings within it, in good hygienic conditions. The standards and regulations presently in force in India with regard to personnel treatment, sanitary conditions, and fire and accident prevention shall be duly taken into account.

4.3.13 **First Aid Stations**

(1) The Contractor shall comply with the applicable laws and health standards presently in force in India. His contractual obligations to this end are stipulated in Clause 6.7 [Health and Safety] of the Conditions of Contract. In the event of an epidemic breaking out, the Contractor shall carry out and comply with all orders, arrangements or regulations which may be issued by the Government or local authorities.

(2) The Contractor shall construct, equip, and maintain the First Aid Station at adequate locations on the Site and at the every camp each.

(3) These facilities shall be fully equipped and staffed as per the applicable regulations in force. These facilities shall be available and fully operational within 140 days after the Commencement Date and maintained in good conditions until the issue of Taking-Over Certificate unless otherwise authorized by the Engineer.

(4) Medical services in the First Aid Stations shall be under the direction of a licensed doctor and nurses on the same working hours as the Works throughout the duration of the construction.

(5) Standing arrangements shall have to be made with the nearest general hospital for providing treatment in case of emergencies and serious cases.

(6) All the other requirements as specified in clause 5.2 of Appendix 2 Project SHE Manual of this Employer's Requirements shall be complied with.

4.3.14 The Contractor shall summarize the design of all his Temporary Facilities in the Temporary Works Design Report and Drawings.

4.3.15 **Temporary Utility Services for the Contractor's Use**
Power Supply and Illumination

(1) The electric power supplies for the Temporary Facilities including but not limited to Contractor's camps, offices, Site, Work Areas and other facilities as described herein shall be arranged by the Contractor at his own cost..

(2) The Contractor may install, operate and maintain its own electrical distribution systems for the power supply for his Temporary Facilities including Site, Work Areas.

(3) The Contractor shall also furnish, install and keep operational the diesel power generating facilities of such capacity what he considers necessary to prevent the interruption of the Works.

(4) The Contractor shall ensure adequate illumination for all his operations at the Site and at the camp. According to National Building Code of India (2005) the minimum intensities for illumination in general shall be as follows:

	Area or Operation	**Luminous Intensity**
(a)	General construction areas, outdoor concrete placement, active storage areas, loading, platforms, refueling, and field maintenance areas	20 Lux
(b)	Indoor construction areas	150 Lux
(c)	General construction plant and shops, e.g. batching plants, mechanical and electrical, equipment rooms, carpentry shops, active storerooms, barracks or living quarters, lockers or dressing rooms, mess halls, and indoor toilets	100 Lux
(d)	First aid stations, infirmaries, and offices	300 Lux
(e)	General interiors warehouses, corridors, hallways and exit ways	100 Lux
(f)	Welding	150 Lux

4.3.16 **Water Supply**

(1) The Contractor shall design, install, operate and maintain water supply systems including pumps, piping system, valves, storage tanks etc., at the Site with respect to:

(a) Industrial water supply system;

For construction use meeting the quality requirements as specified in Specifications

(b) Potable water supply system:

For supply to all the Temporary Facilities including but not limited to Contractor's camps, offices, Site, Work Areas and other facilities for human consumption and use.

In case the Contractor plans to install bore well for water supply, he shall thoroughly investigate the relevant legislation and regulations imposed by the competent

authorities and the installation shall be subject to approval by the said competent authorities and/or the Engineer.

(2) Throughout the duration of the construction, the Contractor shall take samples from all water supplies at regular intervals and test it for its suitability for the intended use.

4.3.17 **Sanitation and Sewerage**

(1) All Sites, offices, workshops, laboratory, camp and other buildings etc. shall be provided with sanitation and sewage handling & disposal system complying with the statutory requirements and applicable laws, Codes & Standards.

(2) If required, portable chemical toilets shall be provided and maintained by the Contractor for the use of all personnel at all work locations,.

(3) All the requirements of Appendix 2 Project SHE Manual of this Employer's Requirements shall also be complied with.

4.3.18 **Waste and Garbage Disposal**

(1) The Site and the Work Areas shall be kept clean and free of refuse at all times.

(2) The Contractor shall collect waste material and garbage from Site, camp, offices, yards and workshops on a daily basis and dispose of the same in the approved area and as per the guidelines prescribed by the local authorities. No waste of any kind shall be deposited in any watercourses.

(3) All the requirements of Appendix 2 of General Specifications vol. II Project SHE Manual to this Employer's Requirements shall also be complied with.

4.3.19 **Fencing and Site Security and Safety**

(1) The Contractor shall be responsible for the security and safety of the Site. Accordingly the Contractor's offices, workshops and storage compounds, campsites, all construction areas, storage areas shall be adequately fenced, gated, lighted and guarded round the clock. Firefighting equipment shall be provided in accordance with the applicable Codes and requirements of local authorities.

(2) The Contractor shall be responsible for any losses occurring within the Site premises.

4.3.20 The Contractor shall install, furnish all these facilities within 140 days after the Commencement Date and maintained in good conditions until the issue of Taking-Over Certificate

4.3.21 **Inspection by the Employer or Engineer**

The Employer and the Engineer have the right at any time to inspect any part of the Contractor's Temporary Facilities and to require immediate rectification to comply with the specified requirements.

4.3.22 **Final Clean-Up**

(1) Upon the Completion of Works, or when any of the plants and facilities have completed its functions, the Contractor shall dismantle and demobilize the temporary facilities and remove all refuse, debris, objectionable material, and fill, grade and dress all the areas to its original condition as it was before commencement of the Work.

(2) No demobilization or removal of temporary facilities and equipment shall be made without prior approval of the Engineer.

4.4 Checking of the Contractor's Temporary Works Design

4.4.1 The Contractor shall, prior to commencing the construction of the Temporary Works as detailed in Clauses 4.3 of [Temporary Works] of this Specification fully check the design and go through the Internal Authorization Process as described in Clause 1.11 [Quality Assurance Requirements] and submit design to the Engineer for consent as part of the Technical Design. Through those process and procedures, the Contractor shall ensure that his Temporary Works have been properly and safely designed and checked the effect of the Temporary Works on the Permanent Works.

4.4.2 In addition to the above the Contractor shall also submit a Design Certificate to the Engineer, duly signed by Chief Design Engineer of the Contractor's Design Team and Contractor's Representative as part of Contractor's Internal Authorization process (as specified in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements) certifying that the Temporary Works have been properly and safely designed and checked including the effect of the Temporary Works on the Permanent Works and has found this to be satisfactory.

4.5 The Site and the Work Areas

4.5.1 The Work Areas, Site including timings, sequence and conditions relating to the Contractor's Possession of the Site during the Construction Phase, his access to the Site prior to the Site possession, and his acquisition of the Work Areas outside Right of Way are detailed in Appendix 1 of this specification and clause of 4.5 of [Requirements for Construction] Employer's Requirements -- Particular Specification.

4.5.2 The availability of the traffic possession , if required to execute the Permanent Works infringing the IR operations shall be as specified in Appendix 1 of this specification [Alignment of Track ways and Work Areas] to the Employer's Requirements and shall be in accordance with Chapter 11 of [DFC Traction Installation Handover] Employer's Requirements -- Particular Specification.

4.6 Safety, Health and Environment (SHE) Requirements

4.6.1 The Contractor shall comply with all the requirements as specified in the Employer's Requirement - General and Appendix 2 Project SHE Manual of this Employer's Requirements.

4.6.2 The Contractor shall prepare and submit to the Engineer for review his proposed SHE plan including Site Safety Plan and Programme within the period as specified in Appendix 2 Project SHE Manual of this Employer's Requirements. It shall, as a minimum, meet the requirements as specified in Appendix 2 Project SHE Manual of this Employer's Requirements. The Contractor's SHE Policy, SHE Plan and Site Safety Plan shall be got approved from the Engineer and other concerned authorities before start of the Work at Site.

4.6.3 The Contractor's Site Safety Plan shall cover the following aspects
(a) Statement of Contractor's Safety Policy
(b) Senior management responsibility for safety

(c) Appointment, duties and responsibilities of Site safety staff
(d) Policy for identifying Hazards
(e) Safety training
(f) Safety equipment
(g) Safety of the Contractor's construction and office equipment
(h) Safety of the workmen and staff at site
(i) Safety procedures for sub-contractors
(j) Disciplinary procedures
(k) Accident reporting
(l) First aid and emergencies
(m) Safety promotion and awareness
(n) Site security
(o) Labour safety

4.6.4 The Contractor's Site Safety Plan shall also incorporate the requirement of Safety while having interface with the running tracks of Indian Railways and complying with:
(a) Indian Railway's rules and regulations for track, signaling and operations possessions
(b) operating a system of permit to work for all works which may affect the operations of the existing railway and
(c) requirements of safety aspects for working near the running tracks of Indian Railways as specified herein below

4.6.5 Engineer reserves the right to order (in writing) the immediate removal and replacement of any of the Contractor's equipment or temporary works which in his opinion is unsatisfactory or not required for the Work for its purpose and / or is in unsafe condition.

4.6.6 Contractor shall be fully responsible for safety of the Works and shall treat safety measures as a priority in all his activities throughout the execution of the Works.

4.6.7 Contractor shall have full regard for the safety of all his personnel, sub-contractor's personnel, the public and all the personnel directly or indirectly associated with the Works on or in the vicinity of the Site and the Work Areas (including without limitation to the persons to whom access to the Site has been allowed by the Contractor), to comply with all relevant safety regulations, including provision of safety gear, and insofar as the Contractor is in occupation or otherwise is using areas of the Site and the Work Areas, to keep the Site and the Work Areas (so far as the same are not completed and occupied by the Employer) in an orderly state appropriate to the avoidance of injury to all persons and shall keep the Engineer/ Employer indemnified against all the injuries to such persons.

4.6.8 Contractor shall provide and maintain all lights, guards, fences and warning signs and watchmen when and where necessary or required by the Engineer or by laws or by any relevant authority for the protection of the Works and for the safety and convenience of the public and all persons on or in the vicinity of the Site and the Work Areas.

4.6.9 When the Work would otherwise be carried out in darkness, the Contractor shall ensure that all parts of the Site and the Work Areas where the Work is being carried out are so lighted as to ensure the safety of all the persons on or the vicinity of the Sites, the Work Areas and of such Work to the satisfaction of the Engineer.

4.6.10 Contractor is required to take note of all the necessary provisions in the Employer's Safety, Health and Environment requirements as specified in Appendix 2 of G.S Project SHE Manual to the Employer's Requirements and the Contract Price shall be deemed to be inclusive of all the necessary costs to meet the standards and requirements as prescribed therein. In case the Contractors fails to meet the above requirements, the Employer may provide the necessary arrangements and recover its costs from any bills due to the Contractor.

4.7 Safety Requirements for Working near Running Tracks of Indian

Railways

4.7.1 Operational Safety

(a) Where the work to be executed is in proximity of the running railway track, the Contractor will be required to observe all precautions and carryout all works that may be necessary to ensure the safety of the running track/trains etc. without imposition of any speed restriction thereon as may be directed by the Engineer. No claim whatsoever will be entertained for either any inconvenience caused to the Contractor or for the re-scheduling of the operations or for any other reasons on this account. The Contractor shall ensure that the materials are not stacked close to the railway track, which may endanger the safety of trains and workmen.

(b) Where the Schedule of Dimensions of Indian Railways for the running tracks of IR are likely to be infringed by the Contractor, the following safety measures shall be ensured.

4.7.2 Measures prior to start of the Work:

(c) Contractor to provide necessary training to their supervisors and staff and shall ensure that they know about the safety norms to be followed for working in the premises of IR and in the vicinity of running tracks and electrified territories

(d) Inform the Engineer / Employer about :

- Name and address of the Contractor's supplier / sub-contractor assigned to execute the work
- Name of the vehicle drivers / equipment operators identified for the work
- Location, duration and timings during which the Schedule of Dimensions of IR is to be infringed

(e) Provide the Engineer / Employer with

- copy of detailed planning of work including protection of IR track and safety measures proposed (duly approved by the Engineer)
- copy of the competency certificate of the Contractor's Supervisor in-charge of the work (to be issued by the Engineer)

(f) Demarcate the working area at site in consultation with the Engineer / Employer

(g) Barricade / temporary fencing along the stretch of the concentration of the work area along the IR track, as consented by the Engineer

(h) Provide adequate watch and ward, flagmen, lighting etc. including signage boards.

4.7.3 Measures during execution of Work:

(a) It shall be ensured that no workmen and staff is working on line / trackside unless proper 'Permit to Work' is issued for those lines by the Indian Railways and Engineer.

(b) It shall be ensured that the moving dimensions of IR shall not be infringed. In case of track crossing, the work is required, the same shall not be carried out without permission from the Engineer and IR. Safety of all the existing fixed structures near the vicinity of the Site shall also be ensured.

(c) No vehicles shall be plied within 6m of centre of the IR track without the specific approval from Engineer / Employer. Individual vehicle / construction equipment shall not be left un-attended. No vehicle shall ply from sun-set to sunrise and during the period when the visibility is impaired, except in case of emergency and with the consent of the Engineer

(d) Where the construction vehicles are required to ply along the existing running tracks of IR, the Contractor shall deploy the adequate patrolmen to prevent tendency of the vehicle drivers to come close to the tracks and infringe.

(e) All the drivers of the road vehicles / machines plying near the running tracks of IR shall be provided with a red flag / red lamp so that in the event of any obstruction, they can stop the incoming train,

(f) It shall be ensured that the line of demarcation shall not be infringed by the road

vehicles / construction equipment

(g) It shall be ensured that only eligible and competent staff shall be employed for the work and they must wear identity card while working near running tracks of IR

(h) For working during night, sufficient illumination shall be provided for the entire work area for safety of the workmen and public

(i) Temporary Engineering signals as required shall be provided

(j) Existing Engineering indicator boards shall be lit as per Permanent Way Manual (PWM) of Indian Railways.

(k) Lookout man with red and green flags / hand signals and whistle shall be deployed wherever required

(l) No part of the stacked material should infringe the moving dimensions of IR. Material shall be stacked to such a height that it does not lead to infringement of SOD in case of accidental toll off.

(m) Any temporary arrangement shall not infringe with the moving dimensions of IR

(n) Where the work is planned to be done within 3.5m from the centre of the IR tracks, it shall require traffic block and all the necessary safety precautions shall be ensured as per the requirements of Para No. 806 and 807 of PWM of Indian Railways.

(o) First aid kit shall be readily available at the site

(p) In case any cable / utility is found while working, the Contractor shall inform the Engineer immediately. In case a large number of cables / utilities are found during excavation, the work shall be carried out in the presence of representative from the concerned owning agency of the utility / cable.

(q) It shall be ensured that the existing emergency sockets of IR are not damaged

4.7.4 Additional measures required during traffic block

(a) Any work when infringing the moving dimensions of IR shall be started only after traffic block has been imposed and IR track is protected

(b) All the work intended to be completed during traffic block shall be completed within the duration of the traffic block and the duration of the traffic block shall not be exceeded.

(c) Traffic block shall be considered as cleared only when all the temporary arrangements / machinery are cleared of the moving dimensions and the IR track is left with proper track geometry so that IR trains can run safely.

4.7.5 Safety measures while working in OHE area

(a) While working near the OHE area, as a maximum the safety guidelines as specified in para 20301, 20327, 20334, 20335, 20529, 20612, 20614, 20714, 20825, 20833, 21206 and 21207 of Volume II, Part 1 of AC Traction Manual of Indian Railways shall be followed

(b) No work close to the live OHE shall be carried out without power block and unless the work area is properly earthed and specific approval from Engineer / Employer

(c) A minimum distance of 2m shall be maintained between live OHE wire and any body part of the workmen or tools or metallic support etc.

(d) No electric connection shall be tapped from OHE.

4.7.6 Excavation Affecting Existing Tracks

While doing excavation near the vicinity of the existing tracks including for bridges and other structures, special care has to be taken to ensure that formation of the existing Railway line is not excavated, for that matter any activity involved in construction / execution of the project shall not endanger the safety of existing running line of Indian Railways. If excavation or any other activity involving working and or modification and or alteration of the existing permanent way then, before execution of such work, the Contractor shall prepare a drawing clearly indicating such alternation /modification of the existing permanent way, and the protection measure intended to be taken by the Contractor to ensure safety of the existing running line. The effectiveness of design of such protection measures is the sole responsibility of the Contractor and the Contractor shall indemnify the Engineer / Employer towards the losses incurred due to failure of such protection measure. These protection measures duly indicating the extent of alternation / modification to the existing formation shall be incorporated in the design and drawing submitted during preliminary design submission as per the Contract.

Such work shall not be undertaken unless and until these drawings are consented by the Engineer

4.7.7 The Contractor shall indemnify the Engineer / Employer against any damage to the existing tracks / structures / utilities etc. caused by the actions of the Contractor or his Sub-contractors, and shall make good the same, as directed by the concerned authorities, at his own cost and shall also pay any penalty(ies) / demurrages if levied by the concerned authorities

4.8 Safety Requirements for Electrical Works

(a) The Indian Electricity Rules 1956, as amended up to date, shall be followed. The detailed instructions on safety procedures given in I.S.S. and Indian Electricity Rules, respective State Electricity Authorities' regulation with up to date amendment shall be applicable.

(b) The LT/HT distribution diagrams of sub stations shall be prominently displayed. The substation premises, main switch rooms and D.B. enclosure shall be kept clean whenever works are carried either inside or outside.

(c) No flammable materials shall be stored in places other than the rooms specially constructed for this purpose in accordance with the provisions of Indian Explosives Act

(d) Rubber insulating mats of suitable size and thickness should be provided in front of the main switch boards of sub-station or any other control equipments of medium voltage and above.

(e) Protective and safety equipment such as rubber gauntlets or gloves, earthing rods, linemen's belt, portable artificial respiration apparatus, safety goggles etc., shall be provided as per the requirement of the Work.

(f) Necessary number of caution boards such as "Man working on line, Don't switch on" shall be readily available in the vicinity of electrical installation.

(g) Standard first aid boxes containing materials as prescribed by the St. John's Ambulance Brigade or Indian Red Cross shall be made available.

(h) Charts displaying methods of giving artificial respiration to a recipient of electrical shock (one in English and another one in the regional language) shall be prominently displayed at appropriate places.

(i) No work shall be undertaken on live installations, or on installation, which could be energized unless one another person is present to immediately isolate the electric supply in case of any accident and to render first aid, if necessary

(j) No work on live L.T. bus bar or pedestal switch board in the sub stations should be handled by a person below the rank of a Licensed Wireman and such a work should preferably be done in the presence of a qualified Engineer.

(k) When working on or near live installations, suitable insulated tool should be used, and special care should be taken to see that those tools accidentally do not drop on live terminals causing shock or dead short.

(l) The electrical switch controls in distribution boards shall be clearly marked to indicate the areas being controlled by them.

(m) Before starting any work on the existing installation, it shall be ensured that the electric supply to that portion is cut off. Precautions, like displaying "Men at Work" caution boards on the controlling switches, removing fuse carrier from these switches shall be taken against accidental operation. Caution boards shall be kept with the

person working on the installation.

(n) All electrical panels & switchgear shall conform to relevant Standard.

(o) All external enclosures shall have degree of protection not less than IP-54

(p) All equipment/system shall conform to relevant IEC standard on Electromagnetic Compatibility (EMC).

(q) Cable routes of all the newly laid cables by the Contractor shall be identified with concrete markers.

4.9 Legislation and Codes of Practice

4.9.1 The Contractor shall comply with all the safety and industrial health legislation including without limitation to the Rules and Regulations of National Safety Council of India. The Contractor shall keep at each site office sufficient copies of Safety and Industrial Health Regulations and related documents.

4.9.2 All regulations and documents as referred above shall be translated in to languages which are understood by the operators engaged by the Contractor or sub-contractor and such translations shall be displayed or kept along side those in Hindi, English and Regional language.

4.10 Protection for Indian Railway Lines

4.10.1 The Contractor shall provide a warning board and where the nearest IR track is closer than 8 m track centres, temporary protection of the existing Indian Railway (IR) lines shall be provided, where the construction activities of the OHE Works are taking place. The temporary fencing / barricades shall be installed as indicated in the Employer's Drawings and the fencing may be movable and reusable. Such fencing or barricades shall be stable enough and not lean and infringe the structure gauge of the IR lines. The fencing pole / barricades shall be coloured to enhance visual precautionary effects. The Contractor shall develop the design of the temporary fencing / barricades as part of the Technical Design and submit the Engineer for consent.

4.11 Damage and Interference

4.11.1 Works shall be carried out in such a manner that there is no damage to or interference with:

(a) water courses or drainage systems;

(b) public utilities;

(c) structures (including foundations), roads, including street fixtures, or other properties;

(d) public or private vehicular or pedestrian access,

(e) monuments, graves or burial grounds other than to the extent that is necessary for them to be removed or diverted to permit the execution of the Works, and

(f) Existing tracks, Bridges, Fixtures / OHE Masts of the existing tracks of Indian Railways

4.11.2 Heritage structures shall not be damaged or disfigured on any account. The Contractor shall inform the Engineer as soon as practicable of any items which are not stated in the Contract to be removed or diverted but which the Contractor considers necessary to be removed or diverted to enable the Works to be carried out. Such items shall not be removed or diverted until the consent of the Engineer to such removal or diversion has been obtained.

4.11.3 Assets / items of the Employer, Indian Railway, Other Contractors and any other entities which are damaged due to Contractor's operations / negligence during construction or are interfered with or removed to enable the Works to be carried out shall be replaces / reinstated by the Contractor at his own cost to the same condition as existed before the Work started and to the satisfaction of the Engineer and the concerned entity.

4.11.4 In case of damage to the existing cables, the Contractor shall have suitable arrangement of joining the cable under technical supervision of IR / relevant authority. In addition to this, the Contractor shall also be responsible for any penal action or any claim as a result of the damage and shall indemnify the Engineer, Employer, Indian Railway, Other Contractors and any other entities in this regard.

4.11.5 In case of obstructions due to interference, the Contractor shall comply with the requirements described in Chapter 9 of [Requirements for Construction] of this specification. Followings are the major required items as detailed therein;

(a) Uncharted Public utilities

(b) Alternative Access

(c) Protection of Trees

(d) Removal of trees, graves and other obstructions

(e) Protection of adjacent structures

4.12 Care of Works

4.12.1 Care of Works, including protection of Works from weather and protection of finished Works from weather, damage or theft shall be as specified in Chapter 9 of [Requirements for Construction] of this Specification

4.13 Handling of Public Utilities and Interferences

4.13.1 The existing public utilities identified within the Right of Way shall, in principle, be relocated and/or diverted by the relevant public utility agencies at their risk and responsibility prior to the Contractor's possession of the Site .

4.13.2 Alternative access which may be needed for all public or private premises when interference with the existing access occurs to enable the Works to be carried out shall be arranged by the Contractor as described in Chapter 9 of [Requirements for Construction] of this Specification.

4.13.3 Trees, graves and other obstructions which may remain at the Site or the Work Areas shall be appropriately removed as described in Chapter 9 of [Requirements for Construction] of this specification.

4.14 Use of Roads

4.14.1 The Contractor shall carry out the Works so as to minimize disruption to roads and pedestrian traffic. In order for that, the Contractor shall comply with the requirements and described in Appendix 2 as Project SHE Manual and Chapter 9 of [Requirements for Construction] of this specification.

4.15 Security

4.15.1 The Contractor shall be responsible for the security of the Site. In order to fulfill the obligation, the Contractor shall comply with the requirements described in Chapter 9 of [Requirements for Construction] of this specification.

4.16 Site Establishments

4.16.1 The Contractor shall provide and maintain the Temporary Facilities and Temporary Utility Services, which comprise part of the Temporary Works for use of the Employer and Engineer as specified in Clauses 4.3 of [Temporary Works] of this Specification.

4.16.2 The Contractor shall provide and maintain all Temporary Works as required by him and as specified but not limited to those detailed in Clauses 4.3 of [Temporary Works] of this Specification, for execution of the Works.

4.16.3 Latrines and wash places:

(a) Contractor shall provide latrines and wash places for the use of his personnel and all persons who will be on the site as per the requirements specified in Appendix 2 as Project SHE Manual to the Employer's Requirements and in accordance with the local laws and regulations.

(b) The size and dispositions of the latrines and wash places shall be according to the numbers of persons entitled to be on Site and Work Areas, which may necessitate their locations on structures and, where necessary there shall be separate facilities for male and females.

(c) The capacity and layout shall be subject to consent of the Engineer.

(d) The Contractor shall arrange regular disposal of effluent and salvage in a manner that shall be in accordance with the local laws and regulations.

(e) The Contractor shall be responsible for maintaining all the latrines and wash places on the site in a clean and sanitary conditions for ensuring that they do not poses a nuisance or health threat.

(f) Contractor shall also take such measures and make such provisions as may be necessary or directed by the Engineer to ensure that vermin, mosquito's breeding etc. is prevented or controlled at times..

4.16.4 Drinking water

The Contractor shall arrange for adequate potable drinking water to his workmen at site of works.

4.17 Testing of Works

4.17.1 The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. A programme of proposed tests shall be provided, at least one week in advance of such events. For off-site testing the programme shall be provided at least 2 weeks in advance.

4.17.2 Notification of required Factory testing shall be made in writing to the Engineer, including full details of test requirement, at least 21 days in an advance of the test.

4.17.3 The Contractor shall comply with all requirements described in Employer's Requirements - Manufacturing, Installation, Testing and Clause 1.11 [Quality Assurance Requirements] and clause 1.8 [Project Programme Requirements] and Chapter 10 of Particular specification [Requirements for Construction] to the Employer's Requirements.

4.18 Provisions for Other Contractors

4.18.1 The Contractor shall construct the Works in full coordination with the Other Contractors and shall comply with the requirements described in Chapter 17 of [Contractor's Coordination with others] Employer's Requirements -- Particular Specification.

4.18.2 Provision of OHE on Viaducts and Bridges
For the support of Overhead Equipment on bridges and viaducts for which the work is to be done by Other Contractors the Contractor shall furnish full details and properly co-ordinate with them so that the this requirement is fully integrated in the design of works of the Other Contractors. This shall be an important design and physical Interface requirement to be performed by the Contractor. This is as described in Chapter 17 of [Contractor's Coordination with others] Employer's Requirements -- Particular Specification.

4.19 Restoration of Work Areas Disturbed by Construction

4.19.1 Unless otherwise directed by the Engineer, any areas disturbed by the construction activity, either inside or outside the Right of Way, shall be reinstated to their original state.

END OF CHAPTER

5 MANUFACTURING, INSTALLATION, TESTING AND COMMISSIONING

5.1 General

5.1.1 These Employer's Requirements establish the overall procedures for the Contractor to follow for the Works that is related to the components manufactured off site and supplied for installation in the Permanent works. These requirements relate to their Manufacturing, Tests procurement, Delivery, tests installation in the system and associated activities (Instructions, manuals, spares and training etc.)

5.1.2 These requirements relate to manufacturing, procurement and delivery of component fittings, conductors, equipment structures, plant and manufactured items and the requirements for installation, testing and commissioning, and associated activities (manuals, spares, training etc).

5.1.3 The Contractor shall submit a comprehensive Test Plan & Programme for the project to the Engineer for his consent.

5.1.4 The Contractor shall inform the Engineer of the installation of the manufactured items including manufacturing plan and schedule of the manufactured items at the manufacturer's facilities.

5.1.5 The Engineer shall be offered to participate for the tests particularly the Type Tests to be performed on the equipment and/or fittings or conductors and/or batches materials to be examined before the material is supplied to the Site.

5.1.6 The Contractor shall organize those participations as required by the Engineer.

5.1.7 The materials delivered to the Site and offered for Inspection shall be manufactured not earlier than one (1) year than the date of installment and their guarantee period shall cover the Defects Notification Period. However the specified period of Manufacturer's Warranty shall commence from the date of commissioning of the Work and all the manufacturer's Warranties shall be in the name of Employer.

5.1.8 All materials shall be as per the Specifications furnished and as consented by the Engineer.

5.1.9 Manufacturing and testing of various components, fittings, clamps, jumpers, droppers, other fittings, components and equipment shall be as per relevant RDSO and other Specifications, as accepted by the Employer.

5.2 Manufacturing

5.2.1 Management

The Contractor shall establish procedures and controls that govern the procurement, integration, manufacture and testing, quality assurance and delivery of plant & equipment, manufactured items and spares to be supplied under the Contract. This shall include the supply of spare parts and warranty in accordance with the Contract. The Contractor's Manufacturing Management and Quality Assurance Plans shall be submitted to the Engineer for consent within 60 days after the Commencement Date as a preliminary plan and as part of the Technical Design for the final Plans for each plant, equipment and manufactured item as described in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements.

5.2.2 Procurement and Subcontract Management

The Contractor's management systems and procedures shall incorporate procedures for materials procurement and sub-contracting, sufficient to assure technical, administrative, quality and contractual controls consistent with those under this contract. The Contractor's management system shall be auditable for materials sources, lot numbers, serialized equipment, etc. Sub-contract amendments shall be effected whenever contractual changes are made bi-laterally by the parties involved subject to consent of the Engineer.

5.2.3 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 shall submit manufacturing data as part of the Manufacturing Management and Quality Assurance Plans as specified in Clause 1.11 [Quality Assurance Requirements] of this Employer's Requirements General Specifications which 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 manufacturers, and sub-contractors for supply.

(c) a delivery schedule of each item of equipment to match installation plan

The manufacturers shall have the qualification and experience in the design, assembly and testing of the similar equipment / material, as being offered, complying with the Specifications and shall be subject to the consent of the Engineer

5.2.4 Testing

A Comprehensive Testing Programme shall be provided by the Contractor that shall include the complete equipment, their subsystems and components and material to assure conformance with the Specifications. The testing Programme shall be subject to the consent of the Engineer and shall be submitted as part of Technical Design Submission. The purpose of the Comprehensive Testing Programme shall be to:

(a) substantiate design and performance characteristics;

(b) ensure operational compatibility;

(c) complete equipment verification and acceptance requirements; and

(d) complete all reliability, maintainability and safety demonstration requirements.

Testing shall comply with the requirements as specified herein in this Employer's Requirements.

5.2.5 Inspection by Engineer

The Contractor shall prepare an inspection programme which shall be consented by the Engineer and shall provide the opportunity for the Engineer and Employer to have access at key points during the production and manufacture of items / materials and plant & equipment to examine, inspect, measure, and test the materials and workmanship, and check progress, as necessary.

Where such an inspection takes place on completion of production or manufacture this may be combined with the testing programme.

5.2.6 Quality Assurance and Controls

(a) The Contractor's management systems shall emphasize quality assurance and controls and shall be based on ISO 9000-2000 standards. The Manufacturing Management and Quality Assurance Plan together with the Comprehensive Testing Programme shall adequately ensure an acceptable level of quality of the manufactured items and equipment supplied. The concept of total quality assurance

shall be based on the principle that quality is a basic responsibility of the Contractor's organization and system employed, and shall be evidenced by:

- producible and inspectable designs;
- firm procurement and job performance specifications;
- firm procedures for transmission of information and data to sub-contractors and ensuring their compliance;
- adequate testing to ensure repetitive product conformity to design requirements; and
- total programme of surveillance and verification of physical performance and configuration accountability.

(b) Adequate records shall be kept by the Contractor to provide evidence of quality and accountability. These records shall include results of inspections, tests, process controls, certification of processes and personnel, discrepant material; and other quality control requirements.

(c) Inspecting and testing records shall be in ISO format and, as a minimum indicate the nature of the observations made, and the number and types of deficiencies found and action proposed to correct deficiencies. Also, records for monitoring work performance and for inspecting and testing shall indicate action taken for the correction of deficiencies.

(d) The Contractor shall submit to the Engineer a request for a "Notice of No Objection to Supply" for the manufactured items along with all the relevant manufacturer's test certificates and inspection certificates prior to shipping / transporting. This shall be accompanied by a Verification Submission which shall provide sufficient documentation to demonstrate the suitability of the plant & equipment and manufactured items for supply. Such Notice may be issued by the Engineer in respect of the completion of manufacturing of the distinctive elements which comprise part of the Permanent Works. However, supply shall not be commenced until the original copies of the appropriate Submission have been endorsed:

- by the Contractor as "Good for Supply"; and
- by the Engineer that he has no objections to the supply.

5.2.7 Shipping
The Contractor shall provide for the proper comprehensive test and inspection of equipment to ensure satisfactory completion of manufacturing and testing / check prior to shipment. All shipments shall be adequately protected to preclude damage during shipment. The Contractor's quality control personnel shall verify the inspection and preparation for shipment.

5.2.8 Handling, Storage and Delivery
The Contractor shall provide for Comprehensive Test and inspection instructions for handling, shipping, storage, preserving, packaging, packing, marking, and shipping to protect the quality of the equipment and to prevent damage, loss, deterioration, degradation or substitution thereof.

5.2.9 Handling procedures shall include the use of special crates, boxes, containers, transportation vehicles, equipment and facilities for materials handling.

5.2.10 Unless otherwise consented by the Engineer, the Contractor shall provide adequate storage facilities by way of covered areas at his own cost for storing in a safe and secure manner all the plant & equipment and manufactured items to be supplied and erected as part of the Contract. Employer shall not provide any storage facility. Means shall be provided for protection against deterioration or damage to equipment in storage. Where shelf life of the equipment / material is limited, this shall be clearly stated on the shipment. Secure compound and storage for the high value items shall be integral part of the safe storage,

Spares to be supplied shall also be kept safe and secure until handed over to the Employer at the time of Commissioning.

5.3 Manufacture and Supply Verification Submission

5.3.1 On completion of the manufacture of plant & equipment and manufactured items, and the associated testing, and quality assurance and control processes, a 'Manufacture & Supply' Verification Submission' shall be prepared which shall provide sufficient documentary demonstration of the suitability of the plant & equipment and manufactured items for subsequent installation, this shall include, but not be limited to:

(a) confirmation that the plant & equipment and manufactured items produced fully comply with the Working Drawings relating to manufacture;

(b) confirmation that all relevant testing has been successfully completed, with supporting completed test documentation;

(c) confirmation that all Quality Assurance and Controls processes have been completed with the required level of satisfaction, with supporting completed quality assurance documentation;

(d) confirmation that the plant & equipment and manufactured items have not suffered damage or deterioration during transit to site.

5.3.2 The Contractor shall not commence the subsequent installation until he has received a Notice of no Objection from the Engineer in respect of the Manufacture & Supply Verification Submission.

5.3.3 Such Notice may be issued by the Engineer in respect of completion of the manufacturing and supply of a major and distinctive element comprising part of the Permanent Works.

5.4 Installation

5.4.1 Installation Plan and Programme
The Contractor's installation plan shall show through CPM/PERT charts how the Contractor proposes to organize and carry out the Installation and complete the whole of the Works by the given Coordinated Dates.

5.4.2 The Contractor shall submit the installation plan for the review of the Engineer at least 60 days prior to the start of installation on site.

5.4.3 If the Engineer so requires the Contractor shall attend meetings with the Engineer to finalize the work details prior to the start of the installation at site.

5.4.4 The Contractor's Installation Plan shall be approved by the Engineer before its implementation.

5.4.5 Installation Method Statement

(a) Installation Method Statements which is part of the Construction Method Statement shall be submitted to the Engineer for review at least 30 days prior to the installation activity commencing on site.

(b) Prior to proceeding with installation, the Contractor shall submit, for the Engineer's consent, six copies of drawings showing all installations including dimensions, supports, hardware, installation methods and documents confirming the availability and location of special installation tools and equipment and all other pertinent data.

(c) The manufacturer's erection instructions shall be carefully followed.

(d) The Contractor shall make certain that the installation of all supports, gaskets, hardware, etc., are accomplished so as to assure safe, accurate and trouble-free installation. The installation for major items such as important components and vital equipment such as Traction and Auto transformers shall be undertaken preferably in the presence of the manufacturer's field service representative.

(e) Upon noticing or being advised of any inconsistencies between the maintenance drawings and documentation and the installed equipment, the Contractor shall notify his acknowledgement to the Employer and correct such errors within two weeks.

(f) Equipment that is improperly installed shall be removed, checked / tested and reinstalled. Any damage caused due to improper installation and removal shall be rectified before reinstallation at no extra cost to the Employer.

5.4.6 Asset Identification

(a) The Contractor shall submit an asset database for review by the Engineer. The database shall contain the complete asset listing for all aspects of the contract works.

(b) The database shall provide the minimum information as follows:

- asset details;
- date manufactured
- date installed; and
- date(s) tested.
- Failure History

(c) All equipment and software shall have a unique identification number that can be identified electronically and manually.

5.5 Testing and Commissioning

5.5.1 General

(a) The Contractor shall provide and perform all forms of testing procedures applicable to the Works relating to plant & equipment and manufactured items and various components and the interfacing of the Works relating to plant & equipment and manufactured items with the Other Contractors and shall conduct all necessary factory, site and acceptance tests.

(b) Prior to commissioning activity the Contractor shall provide adequate training to Employer's staff to enable them to participate in the commissioning activity and later to operate and maintain the installation.

(c) The commissioning activity shall include a period of the Integrated System testing followed by a period of Trial Running attended by the Commissioner of Railway Safety (CRS) or other Authorized Official and for staff training in familiarization of the installation and its proving.

(d) Within 6 months from the date of Commencement of the Work, the Contractor shall submit a comprehensive Testing and Commissioning programme, which shall be part of Comprehensive Testing Programme defining the personnel, procedure and format of testing

(e) All testing procedures shall be submitted at least thirty (30) days prior to conducting any Test. The testing procedures shall show unambiguously the extent of testing covered by each submission, the method of testing, the acceptance criteria, the relevant drawing (or modification) status and the location.

(f) The testing procedures shall be submitted by the Contractor and amended, if required subsequently by the Contractor during the duration of the contract to reflect changes in design of works, interface systems or the identification of additional testing requirements, if needed.

(g) The Engineer shall have the facilities for monitoring all tests and have access to all testing records.

(h) Sufficient time shall be allowed within the testing programmes for necessary alterations to equipment, sub-systems and designs to be undertaken, together with re-testing prior to final commissioning.

(i) The Contractor is reminded that at some point of time, the electric Traction System shall be energized and the additional precautions for the safety and co-ordination of the activities prior to and after 'power-on' shall be anticipated in his co-ordination with Other Contractors and installation, testing and commissioning programmes of all the contractors and all associated with the Traction Power Energisation Programme.

(j) All costs associated with the testing shall be borne by the Contractor including the services of any specialized personnel or independent assessors. The Contractor shall also bear any expenses incurred due to resetting / retesting caused by defects or failure of equipment to meet the requirements of the Contract in the first instance.

(k) In the event of any tests being performed in the countries other than India, the Contractor shall give at least 60 days notice to the Engineer for witnessing the tests. The Contractor shall not be required to bear the cost of the Engineer's visit.

(l) Unless agreed in writing by the Engineer, the personnel engaged on testing shall be independent of those directly engaged in the design or installation of the same equipment.

(m) All testing equipment shall carry an appropriate and valid calibration labels. They shall be periodically checked for calibration accuracy.

(n) All reports of the tests shall be signed by the Contractor's Representative

5.5.2 Inspection and Testing Philosophy.

(a) The inspection of various items shall be carried out by the agencies in the manner as approved by the Engineer.

(b) All field tests shall be witnessed by authorized representative of the Engineer / Employer & recorded. An appropriate format for Test Schedules and Procedures including the details of testing equipment shall be submitted to the Engineer for approval. .. All tools & instruments for carrying out the tests shall be arranged by the Contractor to the satisfaction of the Engineer. Test results will be witnessed and signed by the Contractor and the Engineer.

(c) Prior to shipment of equipment, the Engineer reserves the right to inspect the equipment at the manufacturers' works and the Contractor shall provide and secure every reasonable access and facility at the manufacturers' works for such inspection by the Engineer.

(d) Test Certificates and Reports: The Contractor shall submit manufacturer's type and routine test certificates and reports for each equipment and devices. Complete test results are to be submitted in clearly identified and organized booklets, indicating item of equipment, make, model, type, date of tests, type of tests, descriptions and procedures. Test reports shall also include the Quality Assurance Certification, the standards to which the equipment comply, and the standards to which the equipment was tested.

5.5.3 Sequence of Tests

The sequence of tests shall comprise as appropriate the following:

(a) type tests(if required);

(b) factory acceptance tests (FAT) or works test;

(c) installation tests;

(d) partial acceptance tests (PAT)

(e) functional tests;

(f) integration tests;

(g) dynamic tests;

(h) system / sub-system acceptance tests (SAT);

(i) tests on completion (integrated System tests); and

(j) tests after completion (Trial Running).

5.5.4 Type Tests

(a) Should the Contract include any equipment not previously type tested, or not proven in service on Indian Railways for at least for 3 years, or are of modified design, the Contractor shall undertake Type testing of the unit to the satisfaction of the Engineer. Prior to its production and supply.

(b) Type testing and its approval shall be used to confirm that the proposed equipment or component complies with the design criteria specified and meets the requirements of the Contract. Before taking up its manufacture and supply.

(c) Type Test may not be required in those cases where the contractor can produce certified evidence that the required type tests have been performed successfully on identical equipment of the same design and identical or higher capacity and produced in the factory where the equipment to be supplied under the contract is to be manufactured, provided the type test(s) have been carried out and witnessed by reputed test agency. The final decision regarding applicability and acceptance of the type test certificate produced shall rest with the Engineer.

(d) The Type test shall be witnessed by an independent associate or any other individual as required by the Engineer.

5.5.5 Factory Acceptance Test (FAT)

(a) Works Tests shall include but not be limited to:

- Physical inspection;
- Dimensional test
- Calibration;
- Output check;
- Operational performance;
- Full Load test;
- Flash-over test;
- Insulation test;
- Soak test; and
- Any other test required as per relevant standards or codes.

(b) A Factory Test Plan shall be submitted for the Engineer's review within six (6) months

from the Date for Commencement of the Works.

(c) All materials, components, sub-assemblies, unit assemblies (including software, cables and wiring) shall be subject to testing and certification. Notification of these Tests shall be submitted to the Engineer thirty (30) days in advance of carrying out any Test. . .The FAT shall demonstrate that each equipment/sub-system meet its functional specification.

(d) No equipment or software shall be delivered to the Site until the Contractor has demonstrated to the satisfaction of the Engineer that the equipment or software conforms to the specification by carrying out the FAT.

(e) Where processor based equipment is to be used, the Works Tests shall include also verification of software used in this application.

5.5.6 Samples for Testing

(a) Samples that have been tested may be incorporated in the Works provided that:

- the sample complies with the specified requirements;
- the sample is not damaged;
- the sample is not required to be retained under any other provision of the Contract; and
- Consent of the Engineer has been obtained

(b) Additional samples shall be provided for testing if in the opinion of the Engineer:

- material previously tested no longer complies with the specified requirements; or
- material has been handled or stored in such a manner that it may not comply with the specified requirements.

(c) Unless agreed otherwise, all Tests shall be carried out by the Contractor in the presence of the Engineer.

(d) Attendance on Tests, including that by Engineer / Employer, and the Contractor, shall be as laid down in the Quality Assurance procedures.

5.5.7 Installation Tests

(a) Prerequisites for Installation:

- Prior to installation, the Contractor shall ensure that equipment delivered to Site has not been damaged in transit and ensure for their dimensional accuracy.

(b) Inspection:

- The inspection shall verify that equipment has been installed to the procedures and design that have been reviewed without objection by the Engineer and that equipment is correctly located and labelled.
- The inspection shall verify that any false feed, temporary wiring and redundant items have been removed and that equipment is correctly protected against interference, damage and deterioration.
- The Contractor shall maintain inspection records to demonstrate that each item of equipment has been inspected and found to be satisfactory, and attach to this record a detailed list of any discrepancies found and remedial work carried out.
- As defects are rectified, these shall be recorded on the appropriate inspection record.

(c) Installation Tests

- The Contractor shall carry out installation tests for each sub-system following Installation but before Functional Testing to demonstrate that the installation has been carried out correctly and equipment is properly housed and fixed.
- During and on completion of installation, the Contractor shall undertake testing of all cables, wiring and equipment, instrumentation and protection devices including relays, in a progressive sequence and in accordance with the overall-testing programmes.
- These tests shall culminate in Functional Tests to verify the correct operation of all apparatus and, where appropriate, correct response to the respective control commands or monitored function.
- An inspection and visual verification of ratings and connections of equipment, instrument transformers and auxiliary circuits, installation tests shall be carried out.
- After installation of equipment, visual inspection and operational tests on un-energized equipment shall be carried out to check the following:
  - Cleanliness;
  - Workmanship;
  - Confirmation of items conforming to ratings specified;
  - Water and dust proofing;
  - Leveling, mounting and positioning;
  - Joints and connections tightness;
  - Cables – dressing, bending radii, jointing and finish at terminals;
  - Clearances and dimensions in conformity with drawings;
  - Earthing and bonding;
  - Functioning of circuit breakers, isolating switches and their interlocks;
  - Protection devices;
  - Phase sequence verification;
  - Conformance to as built records.
- Earth resistance measurements – individually and of the subsystem and system as required.
- Insulation Resistance

  The insulation resistance of all 220kV/132kV and 25kV circuits shall be measured. All LV circuits comprising ac and dc auxiliary circuits shall be tested.
- Continuity Test and Contact Resistance

  Continuity of all circuits shall be verified. Contact resistance of all high current joints and bolted contacts, especially the joints of 25 kV conductors and the running rails for return current shall be measured. Earth system joints shall also be measured.
- Protection Equipment

(d) Test Protocol for all site tests

For all tests on components and individual equipment, a site test protocol shall be proposed by the Contractor and approved by the Engineer based on which the requisite tests shall be carried out to prove the suitability of the component.

(e) Partial Acceptance Tests (PAT)

- Installation work shall be completed and inspection records submitted to the Engineer for review before the commencement of each PAT.
- The PAT Plan shall be submitted for the Engineer's review at least one hundred and twenty (90) days before the commencement of each PAT.
- These tests form part of on-site and System Acceptance Tests as part testing of the equipment and system.
  - Functional Tests and Interlock Tests
  - All control and protection functions and electrical/mechanical interlocks shall be tested.
  - Primary Injection Tests

    The Contractor shall carry out primary injection tests on each protective system, to prove the auxiliary circuit connections, the relay fault setting values, the correct metering indications and the stability limits.
  - AC/DC Pressure Tests

    The insulation resistance of all circuits shall be measured before and after the dc pressure test. The minimum phase-to-phase and phase-to-earth insulation resistance shall be 100 mega ohms.

    Pressure tests shall be carried out on completed cable lengths of high voltage cables in accordance with IEC 60502.

(f) Functional Tests

- The functional tests of the PAT shall be carried out on installed equipment before system / sub-system acceptance tests (SAT) to demonstrate that the Section of the Works operates correctly in accordance with the Specifications.
- The functional tests shall sequence through all required operations to prove that the system / sub-system performs in accordance with the Specification and that the local configuration data (for example, control tables) is correct.
- Where necessary, input conditions shall be simulated.
- The functional tests shall be specified and carried out by Contractor's personnel independent of design and installation.

(g) Integration Tests

- Partial Acceptance Test (PAT) shall include integration tests to integrate the various sub-systems of the system and demonstrate correct operation of all internal and external interfaces.
- Following satisfactory completion of these Tests, the Contractor shall prepare the installation for formal demonstration in the presence of the Engineer.

(h) System Acceptance Tests (SAT)

- The Contractor shall prepare and organize a comprehensive programme of Tests to demonstrate to the Engineer that all systems, sub-systems and apparatus defined under the Contract, when installed, connected and configured as a complete system meet the specified performance requirements in all respects.

- Prerequisites and requirements for SAT to be satisfied before the commencement of the system acceptance tests (SAT) shall be as follows:
  - All documentation for the system safety report shall be submitted to the Engineer for review;
  - All PAT shall be completed and test records submitted to the Engineer for review;
  - Facilities for the maintenance of the system shall be in place; and
  - The SAT Plan shall be submitted to the Engineer for review at least one hundred and twenty (120) days before the commencement of the SAT.

(i) The system acceptance tests for the Traction Electrification System shall include, but not be limited to, verification activities which demonstrate that the required criteria have been met for normal and credible emergency feed modes in respect of:

- The control of the electrification system;
- Electrical sectioning;
- System voltages and currents;
- Accessible and touch voltages; and
- Switchgear and protection operation under load and short circuit conditions;
- Functional tests of SCADA system – Vol. III (PS).
- Integrated Tests with Employers Train Operator
- Short Circuit Tests on OHE

  Short Circuit Tests on 25kV overhead lines shall be carried out to prove correct operation of protection equipment and to ensure that the dynamic strength requirements of overhead equipment are met.

  Short Circuit Tests shall be carried out on every overhead equipment line feeder.

  Immunization tests with Indian Railways.

- Traction Power Energisation of a track shall be carried out progressively in stages. For the energisation of section in stages, sectional turn-on of 25 kV ac power may require putting up of temporary works e.g. cable diversion, additional earthing provision, etc. to ensure the safety of workers working in the adjacent non-energized area. Such work inclusive of sectional testing of traction power shall be deemed to be included in the Contract.
- The OHE commissioning shall include as a minimum:
  - Visual inspection: This shall include check for accuracy of construction for ensuring that all the structures, equipment, insulators, jumpers and conductors have been erected as provided in approved Drawings and they are not damaged and remain in healthy state.
  - Dimensional Checks: This shall include dimensional checks to ensure the execution of permanent Works are within the limits of tolerance permitted so as to permit the current collection by locomotives to be satisfactory.

- Final Physical Check

  This shall validate as a minimum that all earths are removed, wires are present and in good condition, nothing is foul of the OHE and all insulators are undamaged and present and auto-tensioning devices are installed and are functional.

- Clearance for Test Charging.

- Section proving

  This test shall be undertaken in each electrical section, to ensure that each electrical section can be successfully isolated from neighboring electrical sections and that the correct OHE alive indications are shown in the TSS control rooms and on the SCADA system.

- Test Charging

- Antitheft Charging

(j) Tests Prior to Commissioning of a section

- Short circuit test

  Each electrical section shall be subject to minimum of two electrical short circuits, one at the remote end under normal feeding and one short circuit at using the extended feeding arrangements. This test shall confirm the mechanical integrity of the OHE and validate that the substation protection systems function correctly.

- Steady current tests

  The steady current test shall be undertaken in each block between TSS and the adjacent TSS. This test shall be used to validate the EMC safety case validate protection system and to confirm the currents in earthing and bonding cables and to allow the measurement of accessible voltages at strategic point in each electrical section.

- The Contractor shall not energize the TSS, SP, SSP, ATP or the OHE until all interfacing parties have issued a letter of no objection. Once all third party letters of no objection have been received then the Contractor shall apply to the "Employer" to seek a letter of no objection to proceed with energisation of the electrical section.

- The Contractor shall be responsible for surveillance and security of the power supply systems including padlocking or otherwise maintaining control of the substation, padlocking of Switchgear and circuit breaker units, distribution switchboards, power panels, etc. throughout all energisation stages of the installation.

- The Contractor shall interface with the Other Contractors to ensure that no downstream cables or other electrical equipment is energized before it has been tested and before other involved Contractors facilities are ready and secured.

- The Contractor's responsibility for surveillance and security of the system shall remain in force for each part of the system until such a time that the Employer takes over the System.

(k) All the tests shall be conducted by the Contractor in the presence of the Engineer.

5.5.8 Records of Tests

Records of Tests carried out shall be kept by the Contractor and a report and all Test results shall be submitted to the Engineer no later than 15 days after completion of the Test, in addition to any other requirements, the report shall contain the following details:

(a) material or part of the Works tested;

(b) location of the part of the Works;

(c) place of testing;

(d) date and time of tests;

(e) technical personnel supervising or carrying out the tests;

(f) equipment used and method of testing with reference to the Specifications ;

(g) readings and measurements taken during the tests;

(h) test results, including any calculations and graphs;

(i) specified acceptance criteria along with remarks whether the criteria have been met;

(j) other details stated in the Contract or as required by the Engineer.

5.5.9 Integrated System Tests

(a) Tests on Completion shall include Integrated Testing including the Work of Other Contractors. The Contractor shall, following satisfactory completion of tests on his works, equipment, sub-systems or system, perform, at the direction of the Engineer, programme of tests to verify and confirm the compatibility and complete performance of his works, equipment, sub-systems or system with the works, equipment, sub-systems or system provided by others.

(b) The Contractor shall submit to the Engineer requirements and procedures, in respect of the Contractor's scope of work, for Integrated System Tests in conjunction with the Other Contractors to demonstrate that the complete system provided under the Contract is fully operational and meets the specified performance criteria.

(c) Integrated Testing and Commissioning refers to those tests undertaken in order to demonstrate that the various components of the railway systems operate satisfactorily between one an other and meet all specified requirements for design, operability, safety, and integration with other works and systems.

(d) These tests shall be entirely within the requirements of one or more of the Project Contracts or they shall involve a multiplicity of Contract procedure. The final Integrated Testing and Commissioning shall be carried out after the SCADA system and OCC have become operational.

(e) Those systems that can be tested without depending on the running of trains, such as SCADA system, etc. will have their integration tests scheduled to commence as early as possible. It is preferable that any interface problems associated with these "train less" system tests be identified and resolved prior to the commencement of test running.

(f) The following is an indicative listing of those Integrated Testing and Commissioning functions that necessarily be integrated with others to demonstrate that the equipment and controls installed therein meet the Contract Specifications and demonstrate a safe-to-operate condition. This listing is not exhaustive and shall be updated by the appropriate contractor, or by the Employer's Representative, to demonstrate functionality, completeness and safety of the installed works.

- Load sharing test between traction transformers, (main and standby)
- Load measuring test circuit breakers.
- Harmonic measurement (Light load and Heavy load).
- TSS, SSP, SP and ATP failure mode test.

- Remote control and monitoring test through SCADA system at OCC.
- Power system functional tests.
- EMI/EMC tests.
- Touch/step potential tests.

(g) On-load Tests and Directional Tests

All protection and metering equipment shall be bench tested at full load before their installation to ensure their correct operation after full load current gets established in the system. The conducting of these Integrated System Tests, by the Contractor and the Other Contractors, shall include a period of Trial Running.

(a) Completion of Test Results

The results of the Integrated Testing and Commissioning shall be compiled and evaluated by the Engineer and the Contractor.

(b) Retesting

If the Works, or a part thereof, or a Section, or a plant & equipment and manufactured items fail to pass the Integrated Testing and Commissioning, the Engineer shall require such failed Tests, to be repeated under the same terms and conditions. If such failure and retesting result from a default of the Contractor and cause the Employer to incur additional costs, the same shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due, or to become due, to the Contractor.

(c) Failure to pass Test

If the Works, or a part thereof, or a Section, or a plant & equipment and manufactured item fail to pass Integrated Testing and Commissioning and the Contractor in consequence proposes to make any adjustment or modification to the Works or a part thereof, or a section, or the plant & equipment and manufactured item, the Engineer may, with the approval of the Employer, instruct the Contractor to carry out such adjustment or modification, at his own cost and to satisfy the requirements of Integrated Testing and Commissioning within such time as the Employer / Engineer may deem to be reasonable.

(d) Statutory Requirements

The Contractor along with others shall carry out all statutory tests and trials, under the supervision of the Engineer, necessary for obtaining sanction of the competent authority, if required, for opening the Railway System.

5.5.10 Performance Verification

(a) The Contractor shall carry out all Performance Tests to verify that the performance of the System meets the Employer's Requirements after the substantial completion of the Works.

(b) For the Performance Tests which shall be carried out by the Contractor in conjunction with Other Contractors or relevant parties (e.g. Indian Railways).

(c) The measurement of EMI levels at locations to be specified by the Employer's Representative. Such measurements shall be carried out prior to energisation of the Traction Power System, and then during Service Trials and commercial operation of the train services to ensure that the EMI levels comply with the requirements of this Specification.

(d) Should the performance of the System deviate from the Particular Specification, the Contractor shall make every effort to rectify the deviation in the shortest possible time, and to the satisfaction of the Employer's Representative.

5.5.11 Trial Running and Commissioning

(a) Following satisfactory completion of the acceptance Tests and the Integrated System Test the Employer will commence an extended period of trial running to prove all technical systems, to the satisfaction of the Engineer and Commissioner for Railway Safety or any other Authorized Official, and to allow all technical systems to settle and to train staff become conversant in working procedures.

(b) The Contractor shall allow for attendance in respect of the Contractor's scope of work over the whole of this period, which may be expected to include maintenance and repair activities and also further opportunity for technical staff training.

5.6 Operation & Maintenance Support Plan

5.6.1 The Contractor shall provide an operation and maintenance (O&M) support plan that shall include such items as:

(a) procedures for O & M for each item, unit / equipment including routine inspection, periodical overhaul and test running;

(b) technical manuals;

(c) initial provision of spares, facilities, test equipment, tools, jigs and fixtures as per approved list;

(d) manpower required for maintenance

(e) training requirements;

(f) procedures for removal and replacement of components;

(g) periodic running of equipment and machines which would otherwise deteriorate because of non-operation for extended periods.

(h) procedure for handling break downs: Traction Power Supply, SCADA and Overhead equipment.

5.6.2 On completion of the Works the Contractor shall deliver up to the Engineer copies of all manufacturing drawings, schedules and software for all components, as well the As-Built Drawings as specified in Clause 1.10.1 of [CAD and Documents Standards of this Employer's Requirements.

5.7 Operation and Maintenance (O&M) Manuals

5.7.1 In addition to the various existing Codes and Manuals applicable to Indian Railways for operation and maintenance of Traction Supply, OHE and SCADA equipment, the Contractor shall produce additional Manuals covering the additional provisions (if any) over and above the various existing Codes and Manuals of Indian Railways in respect of the Operation and Maintenance requirements of various assets created under the Contract.

5.7.2 With reference to the requirements as above:

(a) The Contractor shall produce manuals for all equipment and manufactured items, and sub-systems supplied (if any) for their efficient operations and maintenance. These shall include, but may not necessarily be limited to, the following:

- Manual for Maintenance of Traction Power Supply Equipment
- Manual for Maintenance of Traction Overhead Equipment
- Manual for maintenance of SCADA System
- Manual for Monitoring of the Traction Equipment for use by Maintenance Depots.
- System / sub-system Manuals - A comprehensive description of all system principles at block diagram level.
- Operating/User Manuals - broken into as many sub-sections as may be necessary and providing sufficient information to enable non-technical staff to exploit fully the facilities of each system.

- Workshop Manuals - installation and circuit descriptions, full schematics, circuits, wiring diagrams, mechanical construction drawings and itemized parts list to enable all maintenance rectification and setting-up to be carried out.
- Software System Manuals - for each software package and each piece of equipment which incorporates programmable devices and for which bespoke software has been prepared specifically for this application. Source code listings with comprehensive comments shall be provided for all bespoke software together with configuration listings for all configured standard software packages.

- Equipment Room Manuals - all wiring diagrams and circuits, equipment layout, terminal and cable listing and including such external equipment as may be necessary for completeness.
- Maintenance and Servicing Manuals - to specify requirements, procedures and servicing intervals for planned preventative maintenance and in addition to convey sufficient information on equipment principles and practice to enable first line fault diagnosis and rectification by technician staff.
- Configuration manual for SCADA

(b) Operation & Maintenance manual shall also contain the following:

- Technical description of each system and item of equipment installed, written to ensure that the Employers staff fully understands the scope and facilities provided.
- Diagrammatic drawings of each system indicating principle components and items of equipment
- Name, addresses, telephone, e-mail and fax numbers of the manufacturer of every item of equipment
- Manufacturer's service manual for each major item of equipment, assembled specifically for the project, including detailed drawings, illustrations, circuit details, operating and maintenance instructions, modes of operation, control provisions, sequences and interlocks and preventative maintenance program
- Procedures for fault location and isolation
- Maintenance procedures and their periodicity.
- Tools and Plant needed for maintenance of different Equipment and OHE components.
- Configuration Manual for SCADA.
- All test results conducted on the relevant equipment whether at the manufacturer's place or at site
- Manufacturers' lists of recommended spare parts for items subject to wear and deterioration, giving expected running period and indicating specifically those items, which may involve extended deliveries.

(c) The sub-systems / systems and Operating/User Manuals and a summary (suitable for use at technician level) of the Maintenance and Servicing Manuals shall be prepared in both English and Hindi languages unless otherwise instructed by the Engineer.

(d) The Contractor shall submit all the Manuals for review by the Engineer prior to Factory Acceptance Tests which shall be submitted not later than 4 months from the targeted date of start of Trial Running for the Engineer's consent.

(e) The Contractor shall provide 6 controlled copies of all Manuals along with Electronic version for the use of the Engineer.

(f) The Contractor shall maintain all Manuals in an up-to-date condition throughout the Contract Period wherever applicable.

(g) O&M Manuals and drawings as submitted by the Contractor shall be updated by him during the Defects Notification Period, if required, and shall be re-submitted to the Engineer for review without any extra cost to the Employer.

5.8 Spares, Special Tools and Test Equipment

5.8.1 General

(a) During the Defects Notification Period (DNP), the Contractor shall provide all materials including consumables, unit exchange spares and emergency spares required for maintenance of all systems and structures constructed under this contract.

(b) The Contractor shall also supply all the mandatory spares, materials, jigs and fixtures not later than 4 (four) weeks before commissioning of the system.

(c) An approved list of spares and materials required for maintenance during the Defects Notification Period shall be provided by the Contractor.

5.8.2 Tools and Test Equipment

(a) The contractor shall provide a list of tools and test equipment considered necessary for day to day use in both corrective and preventative maintenance and for workshop use in the overhaul of all modules and units likely to be required for the installation to be procured by the Employer at least six months before the commissioning of the system. The Contractor shall further supply six weeks before commissioning of the system, special tools and test equipment as provided for in Clause 13 of Employer's Requirement –Particular Specification to the Employer.

(b) The Contractor shall submit a schedule of all tools and equipment with details of calibration and supplier along with the Bid.

5.8.3 Spares List

(a) The Contractor shall submit a schedule of recommended spare parts required duly indicating the quantities required for each item of spares, its description, part number, drawing number, lead time, shelf life and number of units required for the period of five years (beyond DNP), name and addresses of principal as well as secondary sources of supply of each spare.

(b) This recommended schedule shall include all types of consumable, unit exchange and emergency spares, the Contractor shall also advise the recommended inventory having regard to the lead time of the respective items.

(c) The Contractor shall:

- submit to the Engineer a list of spares required for the life of the plant & equipment, manufactured items and system / sub-system;
- base the spares calculations on the reliability and availability data and the criticality of the equipment;
- submit to the Engineer for review the calculations of quantities required and the proposed spares list;
- submit to the Engineer a system for easy identification of spares.

(d) The Spares list shall:

- be grouped by plant & equipment, manufactured items and system / sub-system, test equipment and special tools as applicable for stocking identification;
- have detailed description with drawing references and correlation with the maintenance manuals.

(e) In the event that any of the spares identified have a particular shelf life or special storage requirement, this shall be made known to the Engineer with the submission of the spares list, including the necessary action for disposal or storage.

(f) All spare equipment identified on the spares list, shall conform to Identification and Configuration Control requirements established by the Contractor for the equipment provided under the Contract.

5.8.4 Testing of Spares
The Contractor shall ensure that all spares are correctly calibrated, tested and labelled prior to their delivery. Test certificates for each one of the equipment shall be submitted to the Engineer.

5.8.5 Plant / Equipment Identification
All plant & equipment and manufactured items supplied shall be indelibly labelled or otherwise identified to show its identity, type, version, function, location, rating or limitation as appropriate.

5.9 Training

5.9.1 The Contractor shall be required to arrange training to the Employer's staff in respect of design, manufacture, construction, handover, operations and maintenance of the plant & equipment and manufactured items provided under the Contract, these staff will include the Employer's management, operation, technical and instructional staff.

5.9.2 The Contractor shall arrange training for the nominated Employer's staff.

5.9.3 The Contractor shall arrange training of the Employer's Staff in sufficient detail so that the staff can :

(a) appreciate, understand and monitor the technical, operational, maintenance, management and business aspects of the system;

(b) operate, maintain and manage the system efficiently and safely.

5.9.4 For vital and complex items the Contractor shall train the Employer's staff in the manufacturer's works such as SCADA, Relaying and Protection, Traction and Auto-transformers.

5.9.5 Further requirements of training are furnished in sub-clause 1.14.4 of this Employer's Requirements in regard to software training shall also be covered. Further requirements of training needs are described in Chapter 15 of the Employer's Requirements -- Particular Specification

5.10 Transportation and Storage of Plant and Materials

5.10.1 **Packaging and Shipping**

5.10.1.1 All equipment Goods and materials shall be properly inspected to ensure that there are no defects before shipment. An inspection tag bearing the words "INSPECTION PASSED" giving reference number to the inspection date and details to permit verification of inspection details shall be attached to those items inspected satisfactorily.

5.10.1.2 The four adjacent sides of each package shall be marked with permanent paint with the following information:

a) CONSIGNEE
b) COMMODITY
c) CONTRACT No
d) SHIPPING MARK

5.10.1.3 Appropriate caution notices such as "FRAGILE", "HANDLE WITH CARE", "KEEP DRY", KEEP UPRIGHT" along with visual display symbols internationally accepted shall be conspicuously displayed on the outside surfaces of boxes, crates and packages

5.10.1.4 The Contractor shall be responsible for transportation and delivery of materials to site or to the storage space and shall continue to be responsible for their safe storage, handling, erection and commissioning till handing over the materials to the employer.

5.10.2 Transportation and Storage

All manufactured components and equipment shall have been tested and passed in manufacturers Works prior to shipment. The Contractor shall be responsible to prepare, protect and store all plant & equipment and manufactured items so as to safeguard them against loss or damage from repeated handling, climatic influences and all other hazards arising during shipment or storage on or off the Site.

5.10.3 The Contractor shall provide secure and covered storage for all equipment and materials except as otherwise agreed by the Engineer as being suitable for open storage.

5.10.4 Crating

(a) Each case, crate or package shall be of robust construction and suitable for the intended purpose. Packaging materials that are likely to suffer deterioration in quality as a result of exposure to environmental conditions likely to be met during transit from the factory of origin to the Site shall not be used.

(b) The contents of each case, crate or package shall be protected against the harmful effects of ingress of water by enclosing within a heavy duty waterproof membrane

(c) Each case, crate or package shall be legibly and indelibly marked in large letters with the address, Contract number, 'right way up', opening points and other markings like" fragile " "keep dry", "handle with care" etc along with visual display of internationally accepted symbols as necessary to permit materials to be readily identified and handled during transit and when received at Site.

(d) Each case, crate or package shall contain a comprehensive packing list showing the number, mark, size, weight and contents together with any relevant drawings.

(e) A second copy of the packing list shall be enclosed in a watertight enclosure on the outside of each case, crate or package.

(f) Distribution of additional copies of each packing list shall be in accordance with the requirements of the Engineer.

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

(h) Care shall be taken to prevent movement of equipment within containers by the provision of bracing, straps and securing bolts as necessary.

(i) Bags of loose items shall be packed in cases and shall be clearly identified by well-secured metal labels on which the quantity and name of the part and its index or catalogue number have been stamped.

(j) Details of cases, crates, packages, containers, etc., intended to hold important or delicate items of equipment or materials shall be submitted to the Engineer for acceptance.

5.10.5 General Precautions

(a) Spare parts shall be suitably packed for storage over an indefinite period without deterioration and shall be clearly identified, showing full name and part number, without any need to unwrap packaging. Electrical and other delicate items or equipment shall be cocooned.

(b) Cable ends, cable entry points into equipment and other similar terminations and openings shall be sealed or blanked off to prevent the ingress of dirt, vermin or moisture.

(c) Tube ends and other similar openings shall be thoroughly cleaned and then blanked off to prevent ingress of dirt or moisture.

(d) Flanged ends shall be protected by adhesive tape or jointing material covered by a properly secured wooden blank not smaller than the flange itself.

(e) Particular care shall be taken to prevent damage to, or corrosion of, shafts and journals where they rest on timber or other supports that may contain moisture.

(f) At such points wrappings impregnated with anti-rusting compositions shall be used, of sufficient strength to resist chafing under the pressures and movements likely to occur in transit.

(g) Care shall be taken to minimize risk of damage to ball and roller bearings and any fragile material in transit

5.10.6 Specific Requirements.

(a) Power and Control Cables

i) Cables shall be supplied on drums of adequate strength in the longest possible lengths consistent with the requirement.

ii) Each cable drum shall have a distinct identification number displayed on the outside flange. It shall also display following additional particulars

(i) Voltage designation;
(ii) Length;
(iii) Conductor Size;
(iv) No. of cores;
(v) Drum No.;
(vi) Gross and net weights.

iii) An arrow showing direction of rolling shall be shown. Both ends of the cables shall have heat shrinkable caps. The caps shall incorporate sealants which melt on heating at temperatures well above outdoor ambient expected in DFCC area.

(b) Sub Assemblies

All components shall be packed together and properly labeled and numbered. Diagrams to ensure that they are properly assembled at site in the required order of components shall also accompany the packaging.

(c) GIS & Power transformers shipped without insulating oil. The equipment shall be filled in dry condition with inert gas and sealed to ensure that they are received at site in healthy and dry condition. The condition at site shall be examined by a manufacturer's expert, who shall certify that the equipment has been received at site in a satisfactory condition without deterioration.

5.10.7 Packaging Procedures

(a) All Packaging procedures shall be submitted to the Engineer for acceptance.

(b) The Contractor shall remove all empty cases, crates, or packages from the site within 1 month of their being emptied and dispose of them off site.

(c) The Contractor shall provide, for all cubicles, cabinets and panels, a means of locking appropriate to the location.

(d) All locks shall conform to a system suited to meet the requirements of the Engineer.

5.10.8 Managing of Confidential Information

(a) Suppliers / software providers shall ensure that the programs have built-in security procedures and systems to permit management to restrict access to specific portions of the programs or operation thereof, and/or to appropriate staff levels or departments.

(b) Any attempted unauthorized access shall be alarmed and identified.

5.11 Equipment Protection

5.11.1 All plant & equipment and manufactured items shall be capable of short term continuous operation, without the benefit of air conditioning or forced cooling, at the extremes of environmental conditions likely to be encountered. All equipment shall be capable of continuous operation in its normal environment and achieve its stated service life.

5.11.2 The Contractor shall be responsible for ensuring that the equipment and systems are not adversely affected by the harsh environmental conditions or moisture from atmosphere or other adjacent equipment whether provided under the Contract or otherwise.

END OF CHAPTER

6 PUBLICITY & PUBLIC RELATIONS

6.1 Confidentiality of Information

6.1.1 The Contractor shall not publish or otherwise circulate alone or in conjunction with any other person, any articles, photographs or other materials relating to the Contract, the Site, the Works, the project or any part thereof, nor impart to the press, or any radio or television network any information relating thereto, nor allow any representative of the media access to the Site, Contractor's Works Areas, or off-Site place of manufacture, or storage except with the permission, in writing, of the Employer. The Contractor shall ensure that his sub-contractors of any tier shall also be bound by a like obligation and shall, if so required by the Employer, enforce the same at his own expense. The provisions of this Clause shall not exempt the Contractor from complying with any statutory provision in regard to the taking and publication of photographs.

END OF CHAPTER

7 RELIABILITY, AVAILABILITY & MAINTAINABILITY (RAM)

7.1 Definitions

7.1.1 The following terms define the relationships between the key parameters that are to be specified and managed.

7.1.2 These parameters are not to be used interchangeably and shall be used in the correct context in all documentation and the definitions of relevance are:

a) **Reliability** is the probability that an equipment item or system can perform a required function under given conditions for a given time interval.

b) **Availability** is the probability that an equipment item or system is in a state to perform a required function under given conditions over a given time interval, assuming that the required external resources are provided.

c) **Maintainability** is the probability that a given active maintenance action, for an item of equipment or system under given conditions of use, can be carried out within a stated time interval when the maintenance is performed under stated conditions and using stated procedures and resources.

7.1.3 In more general terms, the reliability of a system is a measure of its failure frequency, the availability is a measure of system actual up time compared to total scheduled time for operation, and the maintainability is a measure of the time taken to reinstate the system following failure.

7.1.4 The reliability and maintainability of the Permanent Works shall be developed by the Contractor in accordance with the requirements.

7.1.5 The Contractor shall prepare Availability and Maintainability plans as detailed in European standard EN 50126. The first draft of these plans shall be submitted to the Employer's Representative for review within 6 months of the Commencement Date of the Works.

7.2 RAM Management Programme

7.2.1 The RAM programme shall be integrated into the overall project schedule so that the results, recommendations and insights from detailed RAM studies will influence the development of the project as a whole.

7.2.2 The RAM specifications shall be developed early in the project programme and submitted with the Inception Report.

7.2.3 The management process will not only identify the technical assessments to be undertaken but also relate these to the overall project program.

7.2.4 Outlines of the studies that will be expected during the project to demonstrate the achievement of the specified targets shall be indicated by the Contractor in the Inception Report are given in the following Table for the key project phases.

7.2.5 The basic area against which the system is to be developed is that the system shall be capable of transporting the projected Peak traffic in the horizon year at the quality level defined in the Operational Requirements.

END OF CHAPTER

8 Contractor's Labour Camp

8.1 General

8.1.1 The Contractor shall comply with all requirements as specified in Appendix 2 [Project SHE Manual] of this Employer's Requirements.

8.1.2 The Employer will not provide living accommodation for the use of the Contractor or any of his staff or labour employed on the Works.

8.2 Provision of Labour Camp

8.2.1 The Contractor, shall, at his own expense, make adequate arrangements for the housing, supply of drinking water and provision of bathrooms, latrines and urinals, with adequate water supply, for his staff and workmen at the location authorized by Engineer.

8.2.2 No labour camp shall be allowed at Site without the consent of the Engineer / Employer or any unauthorized place. The Contractor shall prepare a detailed labour camp plan to obtain the consent from the Engineer/ Employer

8.2.3 The Contractor at his own cost shall maintain all camp sites in a clean and sanitary condition.

8.2.4 The Contractor shall obey all health and sanitary rules and regulations, 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.

8.2.5 Should the Contractor fail to provide adequate health and sanitary arrangements these shall be provided by the Employer and the cost recovered from the Contractor.

8.2.6 The Contractor shall at his own cost, provide First Aid Stations as described in Clause 4.3 of GENERAL SPECIFICATIONS VOL. II[Temporary Works] and Appenx 2 of GENERAL SPECIFICATIONS VOL. II[Project SHE Manual] [Safety, Health and Environment Requirements] to the Employer's Requirements.

8.2.7 The Contractor shall at his own cost, provide the following minimum requirements for fire precautions at suitable locations complying with the requirements of applicable Codes:

(a) Portable Fire Extinguishers.

(b) Manual Fire Alarms.

(c) Water Supply for use by the Fire Service.

8.2.8 The Contractor at his own cost shall provide necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

8.2.9 The Contractor shall ensure that electrical installations are done by trained electricians and as per the applicable Codes and Standards and these installations shall be maintained and daily maintenance records shall be made available for inspection of the Engineer.

8.3 Camp Discipline

8.3.1 The Contractor shall take requisite precautions, and use his best endeavours to prevent any riotous or unlawful behaviour by or amongst his workmen, and others, employed directly or through sub-contractors.

8.3.2 These precautions shall be for the preservation of the peace and protection of the inhabitants and security property in the neighborhood of the Works.

8.3.3 In the event of the Employer requiring the maintenance of a Special Police Force at or in the

vicinity of the site, during the tenure of the work, the expenses thereof shall be borne by the Contractor.

8.3.4 The sale of alcoholic drinks or other intoxicating drugs or beverages upon the work, in any labour camp, or in any of the buildings, encampments or tenements owned or occupied by, or within the control of, the Contractor or any of his employees directly or through sub-contractors employed on the work shall be strictly prohibited and the Contractor shall ensure strict compliance with this condition.

8.3.5 The Contractor shall also ensure that no labour or employees are permitted to work at the site in an intoxicated state or under the influence of drugs.

8.3.6 The Contractor shall remove from his camp such labour and their families, who refuse protective inoculation and vaccination when called upon to do so by the Employer / Engineer on the advice of the Medical Authority.

8.3.7 Should Cholera, Plague or any other infectious disease break out, the Contractor shall at his own cost burn the huts, bedding, clothes and other belongings of or used by the infected parties.

8.3.8 The Contractor shall promptly erect new accommodation on healthy sites as required by the Employer / Engineer, within the time specified by the Employer / Engineer, failing which the work may be done by the Employer and the cost recovered from the Contractor.

8.4 Labour Accommodation

8.4.1 The Contractor shall provide living accommodation for all staff employed by himself or his subcontractors that is equal to or exceeds the minimum criteria established in the following sub-sections.

8.4.2 The buildings shall be constructed so as to have a minimum life of not less than the period of the Contract.

8.4.3 The roofs shall be leak-proof and laid with suitable non-flammable materials permissible for residential use under local regulations and for which the consent of the Engineer has been obtained.

8.4.4 Each unit shall have suitable ventilation with all doors, windows and ventilators provided with security leaves and fasteners and back to back units are to be avoided.

8.4.5 The minimum height of each unit shall be 2.10m.

8.4.6 The Contractor shall provide a suitable cooking area.

8.4.7 The number of common toilet/bath/urinals shall be provided as per the provision in Appendix 2 of General Specifications Vol. II [Project SHE Manual] [Safety, Health and Environment Requirements] of the Employer's Requirement.

8.5 Water Supply

8.5.1 The Contractor shall make his own arrangements to provide adequate potable water supply in the Camp.

8.5.2 Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, storage tanks of metal or other approved material shall be provided.

8.5.3 The Contractor shall also at his expense make arrangements for the provision and laying of water pipe lines from the existing mains wherever available.

8.6 Drainage

8.6.1 The Contractor shall provide efficient arrangements for draining away surface water so as to keep the camp neat and tidy.

8.6.2 Surface water shall be drained away from paths and roads and shall not be allowed to accumulate into ditches or ponds where mosquitoes can breed.

8.7 Sanitation

8.7.1 The Contractor shall make arrangements for conservancy and sanitation in the labour camps according to the rules and regulations of the Local Public Health and Medical Authorities.

8.7.2 The Contractor shall provide a sewage disposal system that is adequate for the number of residents in the camp, and which meets the norms of the local authorities.

8.7.3 The provision of the latrines and wash places shall be in accordance with Appendix 2 of [Project SHE Manual] of this Employer's Requirements and as per applicable Codes and Standards. However the layout shall be subject to consent by the Engineer.

8.7.4 The Contractor shall be responsible for maintaining all latrines and wash places on the Site in a clean and sanitary condition and for ensuring that they do not pose a nuisance or a health threat.

8.7.5 The Contractor shall also take such steps and make such provisions as may be necessary or directed by the Engineer to ensure that vermin, mosquito breeding etc. are at all times controlled.

8.7.6 The Contractor shall be responsible for providing water, electricity, communication, sewage disposal arrangements, drainage, roads, paths and parking facilities etc. for all the site accommodations, structures and buildings in accordance with Appendix 2 [Project SHE Manual]. The Contractor shall also be responsible to obtain the necessary approval from the relevant civic and utility authorities and shall maintain all such services that are necessary for satisfactory performance of the Works.

END OF CHAPTER

9 Requirements for Construction

9.1 The Site

9.1.1 As described in Appendix 1 [Alignment of Track way and Work Areas], the Work Areas comprises the Site and areas for the Temporary Works within and outside the Right Of Way (ROW). In this appendix further clarification is made with respect to the construction execution.

9.2 Use of the Site and Work Areas

9.2.1 The Site or Contractor's Temporary Facilities including Contractor's equipment shall not be used by the Contractor for any purposes other than for carrying out the Permanent or Temporary Works or Contractor's Temporary Facilities except that, with the consent of the Engineer in writing.

9.2.2 The Employer will hand over the Site to the Contractor free of encumbrances as per the agreed schedule. Once the Site is handed over to the Contractor, its integrity, safety and security etc. shall be the responsibility of the Contractor until the issue of Taking Over Certificate.

9.2.3 Following the handover of the railway envelope (as defined in the Employer's Requirement – General), the Contractor will control the railway envelope and will be responsible for all matters relating to its integrity, safety and security etc. until the issue of Taking Over Certificate unless otherwise directed by the Engineer.

9.2.4 The location and size of material stacking and each stockpile of materials, including excavated materials within the ROW shall be subject to approval by the Engineer. Stockpiles of materials and stacking of steel etc shall be maintained at all times in a stable condition.

9.2.5 Entry to and exit from the Site shall be controlled in line with the Contractor's Site Safety Plan as described in Clause 6 of the Employer's Requirement – Construction and shall be only available at the locations for which the Engineer has given his consent.

9.2.6 The Contractor shall perform sufficient investigation in these Temporary Facilities to carry out the Works in a most efficient manner with the best quality assurance and summarize it into the Temporary Works Report and other required documents and drawings during the Technical Design development.

9.3 Access to the Site

9.3.1 The Contractor shall make its own arrangements, subject to the consent of the Engineer, for access required to the Site. The Contractor will negotiate with the land owners or other appropriate government agencies to seek temporary occupation of land and seeking necessary permission for construction of temporary access roads.

9.3.2 The existing access roads may be used by the Contractor for transport of his men material and equipment. However, these shall be maintained by the Contractor to satisfactory level to allow uninterrupted flow of traffic including the public traffic otherwise using these roads.

9.3.3 In addition, the Contractor shall ensure that access to every portion of the Site is continuously available to the Employer and the Engineer and other entities authorized by the Employer / Engineer.

9.4 Access / Egress through Work Areas

9.4.1 The Contractor shall be responsible for ensuring that any access or egress through the Work Areas boundaries are controlled such that no disturbance to residents or damage to public or private property occur as a result of the use of such access or egress by his employees and Sub-Contractors.

9.5 Survey of the Work Areas

9.5.1 In addition to the validation of the data provided by the Employer and additional survey, as considered necessary by the Contractor, to check the Right of Way (ROW) and design the Alignment within the available ROW and as described in Sub-Clauses 1.5.3 & 1.5.4 of GENERAL SPECIFICATIONS VOL. II[Validation of Data, Additional Survey and Setting Out] to the Employer's Requirements, the Contractor shall carry out survey to identify any encumbrance infringing the Permanent Works and shall advise the Engineer / Employer accordingly.

9.5.2 The survey shall be carried out before the site clearance wherever possible and in any case prior to the commencement of the Work in any Work Areas. The survey shall be carried out by the Contractor and agreed with the Engineer.

9.6 Temporary Fencing and Signboards

9.6.1 The Contractor shall erect hoardings, temporary fences and/or gates around the Work Areas specifically near the populated areas to prevent entry by unauthorized persons to his Work Areas as long as they are deemed to be necessary. The Contractor shall issue all his personnel including the personnel working with Sub-contractors, identity cards for entering the Work Areas. Necessary arrangements to ensure that no unauthorized person enters the Work Areas and shall be made by the Contractor by way of posting of security guards. Use of hoardings / temporary fencing / signboards etc. shall not be permitted for any kind of advertisement / publicity etc., without the consent of the Employer.

9.6.2 The Contractor shall submit proposals for the fencing of the Work Areas to the Engineer for review. No Work shall be commenced in any Works Area until the Engineer has been satisfied that the fencing installed by the Contractor is sufficient to prevent any unauthorized entry.

9.6.3 Project signboards shall be erected at the Site 28 days prior to the commencement of the construction activities of the relevant Work Area. The types, sizes and locations of project signboards shall be agreed with the Engineer before manufacture and erection of the signboards. other advertising signs shall not be erected on the Site.

9.6.4 The consent of the Engineer shall be obtained before hoarding, fences, gates or signs are removed. Hoardings, fences, gates and signs which are to be left in positions after the issue of Taking-Over Certificate shall be repaired and repainted as instructed by the Engineer.

9.6.5 Hoardings, fences, gates and signs shall be maintained in good order by the Contractor until issue of Taking-Over Certificate.

9.6.6 Hoarding/fencing can be reused after removing from one place to other locations / sites provided they are in good condition and consented by the Engineer.

9.6.7 Damage/worn-out fencing/hoarding shall be replaced by the Contractor within 24 hours. Engineer's decision regarding need for replacement shall be final and binding and if no action is taken by Contractor the same shall be got done by the Engineer and cost of any repairs will be deducted by the Engineer from any payment due to the Contractor.

9.7 Clearance of the Site

9.7.1 All Temporary Works shall be removed by the Contractor upon issue of the Taking Over Certificate except the Temporary Facilities with necessary utility services required for completing his obligations, after the issue of Taking-Over Certificate unless otherwise directed by the Engineer . The Contractor shall dismantle and remove all Temporary Works and the land in which the Temporary Works have been located shall be properly treated to complete the Works as shown in the Construction Drawings.

9.7.2 Care of the Works

9.7.2.1 General

(1) Unless otherwise permitted by the Engineer all works shall be carried out in dry conditions.

(2) The Works, including materials for use in the Works, shall be protected from damage due to water. Water on the Site and water entering the Site shall be promptly removed by temporary drainage or pumping system or by other methods capable of keeping the Works free of water.

(3) The discharge points of the temporary drainage / pumping systems shall be as per the consent of the Engineer, and shall meet all the requirements as described in Appendix 2 [Project SHE Manual] of this Employer's Requirements.

(4) The methods to be used for keeping the Works free of water shall be carefully chosen so that any settlement of or damage to the Works and / or adjacent existing structures should not occur.

9.7.2.2 Protection of the Works from Weather

(1) Works shall not be carried out in weather conditions that may adversely affect the Works unless proper protection is provided to the satisfaction of the Engineer.

(2) Permanent Works, including materials for such Works, shall be protected from exposures of weather conditions that may adversely affect such Permanent Works or materials.

(3) During construction of the Works, storm restraint systems shall be provided where appropriate. These systems shall ensure the security of the partially completed and ongoing stages of construction in all weather conditions. Such storm restraint systems shall be installed as soon as practicable and shall be compatible with the site conditions.

(4) The Contractor shall at all times programme and carry out the Works duly ensuring protective arrangements such that the Works can be made safe in the event of storms.

9.7.2.3 Protection of the Finished Works

(1) The finished Works shall be protected from theft pilferage or any damage that could arise due to any reason. If required, sections of route may be antitheft charged at 2.2kV, but only on following a street protocol as laid down in relevant portion of ACTM and as modified for use on DFCC by the employer and after having completed all steps laid down on Employer's approval.

9.7.3 Handling of Uncharted Public Utility

9.7.3.1 Major and majority of existing public utilities except the overhead power lines of 33kV and below will have been relocated and/or diverted by the relevant public utility agencies at the Employer's cost before the Contractor's possession of the Site(applicable to Civil contract)Any other public utility which interferes the Works and is required to be relocated and/or diverted and which the Contractor interprets as is not inclusive in the Contract, the Contractor shall notify the Engineer of the details of the public utility. The Contractor shall prepare schedule of such utilities.

9.7.3.2 With regard to the public utilities which cannot be relocated and/or diverted prior to the Contractor's possession of the Site but require temporary or permanent diversion during the Construction Phase and uncharted public utilities which interferes the Works, these works shall be carried out by the Contractor as a Variation applying the Provisional Sums in Clause 13.3 of GC.

9.7.3.3 Alternative Access
Alternative access shall be provided by the Contractor at his own cost to all public or private premises when interference with the existing access occurs to enable the Works to be carried out. The arrangements for the alternative access shall be as agreed by the Engineer and the concerned agencies.

9.7.3.4 The permanent access shall be reinstated as soon as practicable after the Works are complete and the alternative access shall be removed and reinstated immediately as soon as it is no longer required. Proper signage and guidance shall be provided for the traffic / users regarding diversions.

9.7.3.5 Trees
Materials, including excavated materials, shall not be banked around trees. Trees shall be protected from damages at all times by the methods consented to by the Engineer. Unless otherwise consented to by the Engineer, trees shall not be trimmed or cut as stated in Appendix 2 [Project SHE Manual] of this Employer's Requirements.

9.7.3.6 Removal of Trees, Graves and other Obstructions
If any trees, graves and other obstructions are required to be removed in order to execute the Works and such removal has not already been arranged for, the Contractor shall draw the Engineer's attention to them in good time to make necessary arrangement for authorizations for such removal. The Contractor shall not itself remove them unless the Engineer has given consent.

9.7.3.7 Protection of the Adjacent Structures and Works
The Contractor shall take all necessary precautions to protect the structures or works being carried out by others adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and any other earth movements or the diversion of water flow arising from its work.

9.7.4 Use of Roads

9.7.4.1 General:
Measures shall be taken to prevent the excavated materials, silt or debris from entering gullies on roads and footpaths; entry of water to gullies shall not be obstructed.

9.7.4.2 All surfaced roads (public / private) which are chosen for construction activities in the Traffic Management Plan shall not be used by the Contractor's tracked vehicles unless protection against damage is provided by the Contractor and /

or appropriate remedial measures are prepared and agreed with the concerned parties.

9.7.4.3 Traffic Management Plan
The Contractor shall develop a detailed Traffic Management Plan for the Works under the Contract. 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 neighborhoods impacted by the construction activities. The Contractor shall implement the Traffic Management Plan throughout the whole period of the Contract.

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

(1) to minimize the inconvenience of road users and the interruption to surface traffic through the area impacted by the construction activities;

(2) to ensure the safety of road users in the impacted area;

(3) to facilitate access to the Work Areas, and to maintain scheduled construction progress.

(4) to ensure traffic safety at each Work Area.

9.7.4.5 Wherever applicable, the Contractor shall obtain necessary approval from the transport authorities and police department for temporary traffic arrangement and control on public roads.

9.7.4.6 Reinstatement of Public Roads and foot paths

(1) Temporary diversions, pedestrian access and lighting, signage's, guarding and traffic control equipment, if any, shall be removed immediately when these are no longer required for the construction activities.

(2) Roads, footpaths and other items affected by temporary traffic arrangements and control shall be reinstated to the same condition as existed before the work started or as consented by the Engineer immediately after the relevant work is complete or at other times permitted by the Engineer.

(3) Wherever required, the Contractor shall submit his plan for reinstatement to relevant authorities and obtain their prior approval to carry out the work.

9.7.5 Security

9.7.5.1 The Contractor shall be responsible for the security of the Site for the full time till the issue of Taking Over Certificate after it is handed over to the Employer as directed by the Engineer. The Contractor shall set up and operate a system whereby only those persons entitled to be involved in the construction activities in the Contract could enter the Work Areas. For the Site located near the populated areas, the Contractor shall with the consent of Engineer provide the specific points only at which entry through the security fence can be effected, and shall provide gates and barriers at such points of entry and maintain a twenty four (24) hours security guard. The Contractor shall also arrange for such other security personnel and patrols elsewhere as may be necessary to maintain security.

9.7.5.2 The Contractor shall maintain all site boundary fences, wherever provided, in good condition, and shall so arrange site boundary fences and security

measures that the drainage arrangement is not affected. Notices shall be displayed at intervals around the Work Areas to warn the public of the dangers of entering the Work Areas.

9.7.5.3 During the progress of the Works the Contractor shall maintain such additional security patrols over the Works Areas as may be necessary to protect his own and his sub-contractor's facilities and equipment as well as the Works. In addition, the Contractor shall coordinate and plans the security of both the Works under the Contract and works of the Other Contractors including Interfacing Parties requiring access to the Site.

9.7.5.4 In order to operate such a security system it will be necessary to institute the issue of unique passes to personnel and vehicles entitled to be on the Work Areas and a system of separately identifiable according to the shifts being worked on the Work Areas. The Contractor shall at the outset determine, together with the Engineer, a system including the design of passes to suit the requirements of the foregoing and to suit the methods of activities to be adopted by the Contractor for these purposes. The Contractor shall at all times ensure that the Engineer has an up to date list of all persons entitled to be on each Work Area at any time. The Contractor shall also introduce a system for issue of passes to any outsider or person/vehicles belonging to agencies other than Employer/ Engineer who may have to visit each of the Work Areas in connection with the Works.

9.7.5.5 The Contractor shall liaise with the Other Contractors and the Interfacing Parties responsible for security of the adjacent areas and ensures that coordinated security procedures are operated, in particular in respect of vehicles permitted to pass through the Site and/or the adjacent sites. The security of the erected Conductors of the OHE as an antitheft charging with 2.2 kV supply shall be carried out in full liaison with Other Contractors.

9.7.5.6 Security and checking arrangements, as felt necessary shall be provided with advice and help of the Police.

9.7.6 Testing of Works

9.7.6.1 Testing

(1) The Contractor shall submit the Project Quality Assurance Plan and its sub-plans as described in Clause 1.11 [Quality Assurance Requirements] of GENERAL SPECIFICATIONS VOL. IIto the Employer's Requirements. According to the plans, the Contractor shall implement tests which are listed, but not limited to, in the Clause 1.11 [Quality Assurance Requirements] of GENERAL SPECIFICATIONS VOL. II.

(2) The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests may be carried out in the Contractor's laboratory, or tests may be carried out in other laboratories if consented by the Engineer provided that:

a) the identified laboratory is accredited by NABL for the relevant work; and

b) particulars of the proposed laboratory are submitted to the Engineer for his consent.

(3) All site specific and in-situ tests shall be done in the presence of the Engineer. The Employer may also be present if he so desires

(4) Equipment, apparatus and materials for all on site, off site and in-situ tests including laboratory compliance tests to be carried out [by the Contractor and / or by the Engineer] shall be provided by the Contractor. The equipment and apparatus shall be maintained by the Contractor and shall be calibrated before the testing starts and at regular intervals as specified and as directed by the Engineer.

(5) Attendance on tests, including that by the Engineer, the Contractor and the designer shall be as laid down in the Quality Assurance Procedures.

9.7.6.2 Batches, Samples and Specimens

(1) A batch of material is a specified quantity of the material that satisfies the specified conditions of relevant approved specifications. If one of the specified conditions is that the material is to be delivered to the Site at the same time, then the material delivered to the Site over a period as consented by the Engineer may be considered as part of the same batch if in the opinion of the Engineer there is sufficient proof that the other specified conditions applying to the batch apply to all of the material delivered over this period.

(2) A sample is a specified quantity of material that is taken from a batch for testing and which consists of a specified amount, or a specified number of pieces or units, of the material.

(3) A specimen is the portion of a sample that is to be tested.

9.7.6.3 Samples for Testing

(1) Samples shall be of sufficient size and in accordance with relevant Standards to carry out all specified tests.

(2) Samples taken on the Site shall be selected by, and taken in the presence of the Engineer and shall be suitably marked for their identification. An identification marking system should be evolved at the start of works in consultation with the Engineer.

(3) Samples shall be protected, handled and stored in such a manner that they are not damaged or contaminated and such that the properties of the sample do not change.

(4) Samples shall be delivered by the Contractor, under the supervision of the Engineer, to the specified place of testing. Samples on which non-destructive tests have been carried out shall be collected from the place of testing after testing and delivered to the Site or other locations by the Contractor and as instructed by the Engineer.

(5) Samples that have been tested may be incorporated in the Permanent Works provided that:

(a) the sample complies with the specified requirements

(b) the sample is not damaged; and

(c) the sample is not required to be retained under any other provision of the Contract.

(d) consent of the Engineer is obtained

(6) Additional samples shall be provided for testing if in the opinion of the Engineer:

(a) material previously tested no longer complies with the specified requirements;

or

(b) material has been handled or stored in such a manner that it may not comply with the specified requirements.

9.7.6.4 Compliance of Batch

(1) The results of tests on samples or specimens shall be considered to represent the whole batch from which the sample was taken.

(2) A batch shall be considered as complying with the specified requirements for a material if the results of specific tests for the specified properties comply with the specified requirements for the properties.

(3) If additional tests are permitted or required by the Engineer but separate compliance criteria for the additional tests are not stated in the Contract, the compliance criteria for the same shall be mutually decided by the Engineer and the Contractor.

(4) Cost of all such tests shall be borne by the Contractor.

9.7.6.5 Records of Tests

(1) Records of in-situ tests and laboratory compliance tests carried out by the Contractor shall be kept by the Contractor on the Site and a report shall be submitted to the Engineer within seven (7) days, or such other time stated in the Contract or in the Quality Assurance Programme, after completion of each test. In addition to any other requirements, the report shall contain the following details:

(a) material or part of Works tested;

(b) location of the batch from which the samples were taken or location of the part of the Works;

(c) place of testing;

(d) date and time of tests;

(e) weather conditions in the case of in-situ tests;

(f) technical personnel supervising or carrying out the tests;

(g) size and description of samples and specimens;

(h) method of sampling;

(i) properties tested;

(j) method of testing;

(k) readings and measurements taken during the tests;

(l) test results, including any calculations and graphs;

(m) specified acceptance criteria; and

(n) other details stated in the Contract and / or as required by the Engineer

(2) Reports of tests shall be signed by the Contractor's site representative, or by any other representative authorized by the Contractor.

(3) If requested, records of tests carried out by the Employer's staff or by the Engineer shall be given to the Contractor.

9.7.6.6 Production Tests (At Works)

(1) Should the Contractor propose or the Contract includes use of any equipment not previously proven in service, the Contractor shall undertake a thorough testing of pre-production units to the entire satisfaction of the Engineer. The Contractor shall identify such equipment which differs significantly from that which is already in service elsewhere.

(2) All materials, components, sub-assemblies, unit assemblies including software, cables, wiring etc. shall be subject to testing and certification. Notification of these tests shall be submitted to the Engineer twenty eight (28) days in advance of carrying out any tests. The Engineer will then determine which items, if any may be accepted based on previous supply or experience.

(3) Where processor based equipment is to be used for the Works, test shall include also verification of software used in this application.

(4) Works Tests shall include but not limited to:

(a) Physical Inspection

(b) Dimensional check

(c) Electrical check

(d) Calibration

(e) Output check

(f) Operational performance

(g) Full load test

(h) Flash over test

(i) Insulation test

(j) Soak test

(k) Non-destructive test to assess integrity or strength of parts

(l) Tests on bearings as specified in Specifications (Volume III of Bid Documents)

(m) Tests on production of rails as prescribed in IRS T-12-2009

9.7.7 Records

9.7.7.1 Records Produced By The Contractor

All the documents produced by the Contractor including drawings of site layouts, Temporary Works etc. and the number of copies to be submitted to the Engineer shall be as per the requirements and standards specified in the Clause 1.10.1 of GENERAL SPECIFICATIONS VOL. II[CAD and Document Standards] of Employer's Requirements.

9.7.7.2 Progress Photographs

(1) The Contractor shall provide monthly progress photographs, which have been properly recorded to show the progress of the works to the

Engineer. The photographs shall be taken on locations agreed with the Engineer to record the exact progress of the Works. Two sets of photographs shall be provided on CD-ROM format with two sets of color prints of 16 cm x 12 cm size as being consistent to Clause 4.21 [Progress Reports] in the Conditions of Contract.

(2) The Contractor shall mount each set of each month's progress photographs in a separate album of a type to which the Engineer has given his consent, and shall provide for each photograph two typed self-adhesive labels, one of which shall be mounted immediately below the photograph and one on the back of the photograph. Each label shall record the location, a brief description of the progress recorded and the date on which the photograph was taken.

(3) All photographs shall be taken by a skilled photographer whose name and experience shall be submitted to the Engineer for consent. Processing shall be carried out by a competent processing firm to the satisfaction of the Engineer.

(4) The Contractor shall ensure that no photography other than meeting the contractual obligation is permitted on the Site without the specific consent of the Employer.

(5) The said photographs shall become the property of the Employer and shall not be reproduced for any purpose without the consent of the Employer.

9.7.7.3 Records of Wage Rates

The Contractor shall keep monthly records of the average, high and low wage rates for each trade/tradesman employed on the Site and records shall be made available to the Engineer during inspection.

9.7.8 Materials

9.7.8.1 Materials and goods for inclusion in the Permanent Works shall be new and complies with the relevant specifications. Preference shall be given to local materials where available.

9.7.8.2 Certificates of tests by manufacturers which are to be submitted to the Engineer shall be current and shall relate to the batch of material delivered to the Site.

9.7.8.3 True copies of certificates duly certified by the manufacturer and the Contractor may be submitted if the original certificates could not be obtained from the manufacturer.

9.7.8.4 Parts of materials which are to be assembled on the Site shall be marked to identify the different parts.

9.7.8.5 Materials which are specified by means of trade or proprietary names may be substituted by materials from a different manufacturer which has received the consent of the Engineer provided that the materials are of the same or better quality and comply with the specified requirements.

9.7.8.6 Samples of materials submitted to the Engineer for information or consent shall be kept on the Site and shall not be returned to the Contractor or used in the Permanent Works unless permitted by the Engineer.

9.7.8.7 The samples shall be used as a mean of comparison which the Engineer shall use to determine the quality of the materials subsequently delivered. Materials delivered to the Site for use in the Permanent Works shall be of the same or better quality as the samples which have received consent.

9.7.8.8 All the surplus serviceable material (if not required by the Employer and unserviceable material shall be carried away from the Site by the Contractor and disposed off in the manned consented by the Engineer.

9.7.9 Treatment and Disposal of Surplus Material

The disposal of surplus or waste material,, debris of demolished existing structures or buildings and unsuitable material etc. shall be the full responsibility of the Contractor and these materials shall be treated and disposed of by the Contractor at an approved location(s) at his own cost. The disposal plan and programme shall be subject to approval by the Engineer.

APPENDIX 1 ALIGNMENT OF TRACKWAYS AND WORK AREAS

1. Alignment Drawings for Traction Overhead Equipment and Site Plans for Traction Substations, the Sectioning Posts, Sub- Sectioning Posts and Auto-Transformer Stations.

1.1 The proposed Alignment generally runs parallel to the existing alignment of Indian Railways (IR). The Alignment Drawings for whole stretch of the Alignment covered in this Contract are attached in the Employer's Drawings (Volume IV of the Bid Documents).

1.2 The Alignment Drawings provides the:

(1) indicative Plan & Profile of the Alignment (Horizontal and Vertical Alignment) & yard layout for each Station as developed by the Employer,
(2) position of the existing Indian Railway tracks,
(3) available Right of Way (ROW) as acquired by the Employer (with reference to the list containing the 'Width of the available Right of Way (ROW) for the Permanent Works' as per Attachment 1 to the Scope of Works;
(4) location of each civil and track structure along the Alignment
(5) start & end chainage of the all the Station areas etc.

The ROW has also been physically stacked at Site all along the Alignment.

1.3 The Site Plans indicate land acquired adjacent to the Alignment for location of outdoor Traction Sub-stations, the Sub-sectioning Posts and the Sectioning Posts.

1.4 The Alignment Drawing has been furnished to the contractor only for indication purposes to enable him to generally design the Traction OHE and Power Supply arrangement.. The Final Alignment Drawing shall be made available to the Contractor after the Coordination Event No. CT-3 (To check the coordination event as per the revised table of coordination events)which shall be the Drawing based on which the contractor shall make his Construction Designs, and the Construction Plans. The Contractor, however, shall be responsible for validation of the data provided by the Employer and additional surveys if considered necessary and investigations necessary for development of his Designs.

1.5 During validation of the data and additional surveys, conducted by the Contractor, he shall during the Technical Design development on the final Alignment and yard layout for each Station ensure that it fully provides for the design of all the Traction Works and is consistently developed without infringing the ROW, the land available in the Site Plans for Traction Installations, the Structure Gauge and the Clearances, as stipulated in the Specifications.

2. Site and Work Areas

2.1 Definition

(1) The 'Site' is where the Permanent Works are to be executed within the available ROW, (which is described in the Scope of Work included in Employer's Requirement – Functional and also marked on the Alignment Drawings). The 'Site' also includes the land acquired adjacent to the Alignment for location of Traction Substations, the Sectioning Posts and the Sub-sectioning Posts for supply and control of power to the traction OHE.
(2) The Work Areas comprise of the Site and also areas for the Temporary Works which may be located outside the 'Site'.

2.2 Contractor's Possession of the Site

2.2.1 The Employer has already acquired the land within Right of Way (ROW) and those for TSS, SSP and SPs.

2.2.2 The Employer shall hand over the land for TSS, SSP and SPs as required for execution of Permanent Works as per the schedule mutually agreed upon between the Contractor and Employer in respect of each of the identified Work Segment (as defined in clause 4.5.16 of Employer's Requirements – Particular Specification) in ROW. On finalization of Traction Supply Diagrams, the Contractor may examine the suitability of the available land. In case no suitable land has been acquired for the supply control post, the contractor shall size and configure the equipment so that the outdoor equipment of switching post is accommodated within the land made available or in the ROW. In case of location of neutral sections opposite the TSS and Section posts, the neutral section may have to be located at suitable locations after due consideration of vicinity to station cross-overs and in juxtapositions with signals. In such cases short length of feeder wires up to the neutral section may have to be run.

2.2.3 Conditions of Possession of the Site from the Employer shall be described as follows:

(1) The possession of land and structure constructed by the other contractor (Civil and Track) as required for the execution of Permanent Works within the ROW shall be handed over to the Contractor for taking up the Traction Works free of encumbrances.

(2) Before handing over the possession of the Site, which may be composed of multiple Work Segments the Employer shall:

a) Cut, grub and remove all trees within the land required for execution of Permanent Works in the ROW having girth more than 300mm
b) Demolish all the buildings and constructed facilities including those basement and substructures within the land required for execution of Permanent Works in the ROW and remove the demolished materials from the Site;
c) Divert all public utilities in the ROW or on Site adjacent to the ROW other than those specified by the Engineer

(3) Although the Site shall become a possession of the Contractor during his construction as described below, the Contractor shall be solely responsible for maintaining the same and reinstating the same within the occupancy of Temporary Works to the entire satisfaction of the Engineer / Employer at his own expenses.

2.3 Contractor's Access to the Site

2.3.1 The timings, sequence and conditions relating to the Contractor's possession of the Site are variously set out in accordance with the Clause 2.1 [Right to Access to the Site] in the Conditions of Contract and as detailed below:

(1) The Contractor shall divide the Site into separate segments and shall elaborate a schedule for the time periods of the availability of these areas for his contract performance.

(2) The Contractor shall indicate the exact nature of the various Work Segments and the extent of Works to be carried out therein and time required prior to the execution of the Permanent Works or making use of the area as working space and/or for temporary works / site facilities.

(3) The information as above shall be submitted as part of the Contractor's technical proposal and shall be finalized before the Commencement Date and shall be subject to consent of the Engineer and approval by the Employer.

(4) On the basis of the approved information above, the Contractor shall submit proposals for the use and the occupation of the each Work Segments of the Site, such submissions being at least 60 days prior to the programmed use of the specific segment of the Site. The availability of Work Segment will only be permitted for the actual duration of the Permanent and Temporary Works within the particular Work Segment of the Site.

(5) Prior to the scheduled dates for returning of any of the Segment / works areas for subsequent use by Other Contractors / Interfacing Parties / Employer, the Contractor shall carry out the following activities:

a) Construct all Permanent Works within the Work Segment of the Site, to the extent as defined in the Technical Design and in accordance with the requirements of the Contract;

b) Reinstate the area to the same condition as it was taken over from the Employer, unless otherwise as consented by the Engineer and the Employer;

c) Form the area to the approved lines and levels and carry out such other works as may be required by the provisions of the Contract;

d) Remove all rubbish, debris and other materials to the entire satisfaction of the Engineer and the Employer.

(6) The schedule for all the Segments / work areas as above shall include, but not limited to the following data:

a) Indication of the segments of the Site;

b) Description and intended use of the segments of the Site;

c) The start and the end date of the availability of the segments of the Site, required by the Contractor;

d) The start and the end date of the periods in which the Contractor shall allow the segment of the Site to be accessed by the Other Contractors and / or the Interfacing Party(ies).

e) Should the Contractor, for the safe and proper execution of the works, require to take a temporary possession of IR tracks he shall, not later than 56 days prior to the proposed possession date, submit a request for track possession to the Engineer. The Contractor's request shall detail the purpose; proposed duration and any other such particulars as may be reasonably requested by the Engineer. The Engineer, through the Employer shall make provisional arrangements with the DFCC/Zonal Railway for the possession to be taken. Not later than 7 days in advance of the provisional possession, the Contractor, Engineer, Employer and the designated officer of the DFCC/Zonal Railway shall meet to confirm the detailed arrangements for the possession and the possession shall be confirmed. The cost of arranging such possessions shall be borne by the Employer.

f) If any confirmed possession cannot be given up by the DFCC/Zonal Railway at the agreed date & time, the Employer will bear the cost and time incurred by the Contractor for such possession failure.

g) If the Contractor fails to take up a confirmed possession or fails to hand back the tracks to the DFCC/Zonal Railway at the agreed time, the Contractor shall bear the costs incurred by the Employer and the DFCC/Zonal Railway.

2.3.2 The Contractor shall comply with the requirements described in clause 4 Construction Requirements of Vol. II, of this specification with regard to the Works to be executed after the possession of the Site.

2.3.3 The Contractor shall submit the Engineer a proposal for the use of the Site for the survey and investigation if required for the Technical Design. The Contractor shall be given access to the Site for the same as per the programme prepared by the Contractor and consented by the Engineer and approved by the Employer. Such a submission shall be at least twenty eight (28) days prior to the programmed use of the specific segment of the Site.

3. Contractor's Operations outside Right of Way (ROW)

3.1 The Contractor shall be solely responsible for acquiring the additional land (land in addition to the Site within ROW) required by him for his Temporary Works areas outside the ROW, at his own expenses, including maintaining and reinstating the same on completion of the Works to the entire satisfaction of the land owner and the Engineer. Activities for such Temporary Works are detailed in Clause 4.3 of [Temporary Works] to the Employer's Requirements – General Specifications vol. II.

3.2 The Contractor shall make necessary arrangement with land owners and relevant government authorities for any work to be undertaken outside the ROW. Two copies of all the relevant documents / permissions / agreements etc. as required by the Engineer in respect of the land arranged by the Contractor outside ROW shall be submitted to the Engineer. Before commencing operations, the Contractor shall also submit the Engineer a detailed plan and a programme of the Works to be carried out in the Work Area including the areas outside the ROW as described in Clause 1.8 of General Specifications Vol. II [Project Programme Requirements] and Clause 4.3 of General Specifications Vol. II [Temporary Works] to the Employer's Requirements.

3.3 When using and/or occupying the Work Areas on the existing public roads, the Contractor shall take necessary procedures and mitigation measures as described in clause 4.3 - Temporary Works and clause 4.6 of SHE Requirements of General Specifications vol. II

3.4 The Contractor shall submit the Engineer proposals for the use and occupation of such of the Work Area. Such a submission shall be at least sixty (60) days prior to the programmed use of the specific Works Area.

3.5 On completion of the Works, the land arranged by the Contractor outside the ROW shall be restored back to its original condition or to the entire satisfaction of the land owner and the Engineer.

∗ End of Appendix 1 ∗

APPENDIX 2 PROJECT SHE MANUAL

1. SHE Framework

1.1 GENERAL

1.1.1 The SHE requirements contain two major items: environmental and social protection; and accident prevention and health promotion for all persons involved in and affected by the Works under this contract. Measures relating to the SHE requirements shall be taken by the Contractor in accordance with the requirements detailed in the Clauses herein. The clauses hereunder set out the Employer's requirements regarding the maintenance of human health and safety, and protection of the natural and social environment, during design and implementation of the Works, until completion of the Contract. Safety, health and environment are key issues in a project of this size, involving some locations that are highly populated and others that are environmentally and socially sensitive. In view of the size and complexity of the project, and the potential extent and sensitivity of these issues, the Contractor is required to provide a Chief Accident Prevention Officer (CAPO) who will be responsible for maintaining the Health and Safety of all persons who may interact with the Works and a Chief Environmental Officer (CEO) responsible for environmental and social protection.

1.1.2 First, under the SHE requirements, the Contractor shall establish measures to carry out his design and construction process to the highest standards of environmental and social practice and to comply with all relevant Indian environmental and social laws, standards, codes and regulations. The Contractor shall incorporate the principles of good environmental practice and minimizing negative environmental and social impacts into the Works contained in the Contract.

1.1.3 Second, the Contractor shall at all times be solely responsible for maintaining the safety and health of all his employees and of the general public whilst exposed to construction activities whether on or off-site. The Contractor shall take reasonable precautions to maintain the safety and health of all his employees during working hours in the Work Areas and during other hours in his employee's accommodation camps. His Employee's camps shall meet the requirements detailed in Clause 4.3 of GENERAL SPECIFICATIONS VOL. II[Temporary Works] to the Employer's Requirements. The Contractor shall also include measures with respect to HIV/AIDS prevention as described hereinafter.

1.2 OBLIGATIONS

1.2.1 Scope

1.2.1.1 The Contractor shall be solely and completely responsible for environmental and social impacts induced by the Works under consideration/investigation, design and construction, and also responsible for safety and health conditions in the Work Area, including the safety of all persons involved in and affected by the Works, until the completion of the Contract. These requirements shall not be limited to normal business hours or other time constraints, nor be reduced or diminished in any way because the Contractor is not given sole occupation of the Work Area after the possession of the Site and/or legitimate possession of the Work Areas outside the Right of Way (ROW) such as Contractor's Borrow Pits and/or Quarries.

1.2.2 Management Plans

1.2.2.1 The Contractor shall formulate a SHE Policy as per Section 39 of the BOCWR and submit it within a period of 28 days after the Commencement Date. He shall obtain approval from Director General of Ministry of Labour, Govt. of India within a period of 42 days of

Engineer's No-objection of the Policy. He shall immediately thereafter, arrange to display it at conspicuous places at work sites in Hindi and a local language understood by the majority of construction workers.

1.2.2.2 Within 42 days after the commencement Date the Contractor shall submit a detailed and comprehensive SHE Plan. The SHE Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance of the contract provisions.

1.2.2.3 Particular Attention shall be made to minimize the environmental impact and to prevent accidents. As to the Environmental Protection, the following plans shall be supplemented to the SHE Plan as detailed hereinafter in Clause 2.4 [Contractor SHE Policy and Plan].

(1) Environmental and Social Management Plan: The Contractor shall prepare an Environmental and Social Management Plan (ESMP) setting out in detail how he proposes to manage and minimize the environmental and social impacts of his activities throughout Design and Construction Phases until the completion of the Contract. The Contractor shall submit an Environmental and Social Management Plan for consent by the Engineer within 42 days after the Commencement Date. The ESMP shall have the content and format specified in Attachment 1 [Contractor's Environmental and Social Management Plan] to Appendix 2. The Contractor shall amend and improve the Plan addressing comments made by the Engineer and submit a final ESMP within 28 days of the receipt of comments. Following receipt of the Engineer's written notice of "no objection", the Plan will become the Contractor's ESMP with which the Contractor shall accomplish one of the obligations as required herein.

(2) Environmental and Social Monitoring Plan: The Contractor shall prepare an Environmental and Social Monitoring Plan (ESMoP) setting out in detail the monitoring he proposes to conduct in order to: ensure that all specified mitigation measures that are the Contractor's responsibility are implemented; that the measures protect the environment as intended; and that the Contractor complies with all relevant legislation and the conditions of any environmental consents he is required to obtain. The ESMOP shall have the content and format specified in Attachment 2 [Contractors Environmental and Social Monitoring Plan] to Appendix 2. The Contractor shall also prepare a Safety and Health Monitoring Plan (SHMoP).

(3) Inspection and Audit: The Contractor shall audit all of the activities described in his ESMP and ESMoP and SHMoP at monthly intervals (as part of Monthly SHE Audit) or as otherwise required by the Engineer and shall keep appropriate records of this activity.

As to the Accident Prevention, the following plans and programmes shall be supplemented to the SHE Plan.

(4) Safety Plan and Programme: The Contractor shall prepare a Safety Plan and Programme (SP&P) to effectively implement the preventive measures taking into account of envisaged conditions, situations, and particular activities of the Works which may induce accidents. Then the Contractor shall plan and programme the measures to be implemented in all Work Areas in various construction stages. The Contractor is responsible for incorporating the accident prevention measures against anticipated dangerous occurrences into the SHE activities to enable to efficiently carry out the measures in a practical manner. The SP&P shall have the content specified in clauses and paragraphs hereinafter relevant to the Safety Requirements. Submission procedure shall be the same as that of the ESMP.

(5) Safety Monitoring Plan: The Contractor shall prepare a Safety Monitoring Plan (SMoP) setting out in detail incompliance with the relevant clauses and paragraphs hereinafter relevant to the SHE management.

(6) Inspection and Audit: The Contractor shall audit all of the activities described in his SP&P and SMoP at monthly intervals (as part of Monthly SHE Audit) or as otherwise required by the Engineer and shall keep appropriate records of this activity.

Aforementioned Plans and Programmes shall be main part of the SHE Plan and submit them to the Engineer for consent following the SHE Policy submission.

1.3 ORGANIZATION

1.3.1 The Contractor shall provide and maintain an organizational structure which is comprised of a team referred to as the Environmental Team being in charge of the environmental and social protection and a team referred to as the Health and Safety Team being in charge of the accident prevention and health promotion to effectively implement activities to fulfill the obligations as described hereinbefore. The Contractor shall within 42 days after the Commencement Date nominate a fully qualified and experienced SHE Director - the most senior director in the project as having overall responsibility for SHE management. The SHE Director is responsible for directing and coordinating multiple disciplines in the Contractor's organization including the Environmental Team, the Health and Safety Team as being in the SHE organization, the Design Team, and the Construction Teams as being the core design-build functions. These Design Team and the Construction Team are detailed in Clause 1.11 [Quality Assurance Requirements] to the Employer's Requirements. The Contractor shall ensure that the Contractor's Representative shall be responsible and directly accountable to the SHE Director in all the concerned matters. The Contractor shall appoint SHE management officers and personnel in his Environmental Team as described sub-clause 1.3.2 and his Health and Safety Team as described sub-clause 1.3.3. These appointments shall be subject to a statement of "no objection" by the Engineer.

1.3.2 Within 42 days after the Commencement Date, the Contractor shall appoint a suitably qualified and experienced full time Chief Environmental Officer (CENO) who will be responsible for day-to-day environmental management, supervision and monitoring in and outside the Work Area, and for implementing all aspects of the Contractor's ESMP and ESMoP. The CENO will have authority to stop construction works if environmental non-compliance is observed. The Contractor shall also appoint at least one Senior Environment Officer (SEO) at each site, who has delegated responsibility for environmental management on each shift at that site. The SEO shall be assisted by Environment Officers (EO) working under his direction as necessary. Environmental affairs include social issues, and the ESMP shall also identify a Community Liaison Officer (CLO) who will deal with community relations and liaise on behalf of the Contractor with people who may be affected by the construction process. Within 42 days after the Commencement Date the Contractor shall also appoint a full time Chief Accident Prevention Officer (CAPO) who will be in charge of all matters concerning health and safety in relation to the Works. The CAPO shall be suitably qualified and experienced. His minimum qualifications shall be as per provisions contained in Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Central Rules, 1998. The CAPO shall be authorized to initiate accident prevention measures and monitor the workplace conditions in these respects. Specifically he shall: act as per the provisions contained in the relevant national laws, especially BOCWA and BOCWR; implement, maintain and monitor compliance with the Safety and Health Plan and all safety procedures; and be based full time in a relevant site office. The Contractor shall also appoint at least one Senior Accident Prevention Officer (SAPO) at each site, who has delegated responsibility for the maintenance of safety and health on each shift at that site. The SAPO shall be assisted by Safety and Health Officers (SHO) working under his direction as necessary.

In addition to the aforementioned location-based staffing, the Contractor shall provide the following function-based staffing, including but be not limited to:

- Occupational Health Officer(s) with Nursing Assistants for administration and operation of the First Aid Stations as described in Clause 4.3 of General

Specifications Vol. II [Temporary Works] to the Employer's Requirements;

- Senior Traffic Engineer(s) for establishing the Traffic Management Plan and implementing/ monitoring the Plan as described in Clause 3.7 of Particular Specification [Requirements for Design] and Sub-clause 3.9 of Particular Specification [Requirements for Construction] to the Employer's Requirements;
- House Keeping and Site Maintenance Squads for operating and maintaining the Temporary Facilities for the Contractor's use and for the Employer's and the Engineer's use.
- Labour Welfare Officer(s) with supporting staff for overall general administration for SHE management.

1.3.3 The Contractor shall not remove the appointed the aforementioned Officers without the prior written consent of the Engineer, and any replacement shall be nominated by the Contractor at the same time that the consent is sought.

1.4 CONDITIONS OF PROVISIONS

1.4.1 The provisions listed herein regarding environmental and social protection, and safety and health promotion shall apply to and be binding upon the Contractor, his employees, and any sub-contractors and their employees, for any activities related to the construction works whether in and outside the Work Area. The Contractor shall ensure that proper and adequate provisions to this end are included in all sub-contracts placed by him.

1.4.2 These provisions may be overridden in the event of an extreme emergency, where works or actions are necessary in order to save life or property, or to maintain the safety of the Works.

1.4.3 The Contractor shall also routinely observe and monitor the environmental and social impacts of the ongoing construction activities, and safety and health conditions of all his employees and of the general public whilst exposed to construction activities whether on or off-site. The Contractor shall take any further action as may be deemed necessary by the Engineer to mitigate and/or to prevent any additional unexpected impacts and/or results that may occur.

1.4.4 The Engineer will inspect the Contractor's environmental and social, and safety and health performance in the course of his normal supervision activities, and the Contractor will cooperate by providing access to the Work Area, and such sites, equipment, staff, records, etc. as may be requested by the Engineer either in writing or verbally.

2. SHE Management

2.1 GENERAL

2.1.1 Scope

2.1.1.1 This document defines the principal requirements of the Employer on Safety, Health and Environment (SHE) associated with the Contactor / sub-contractor and any other agency to be practiced at construction worksites at all time.

2.1.2 Definition / languages

i) **In this document:** BOCWA means Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.

ii) BOCWR means Building and other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998.

2.1.3 Application of this document

This document applies to all aspects of the Contactor's scope of work, including all aspects conducted by sub-contractors and all other agencies. There shall be no activity associated to the contract, which is exempted from the purview of this document.

2.1.4 Purpose of this document

2.1.4.1 The objective of these guidelines is to ensure that adequate precautions are taken to avoid accidents, occupational illness and harmful effects on the environment during construction.

2.1.4.2 This document:

i) Describes the SHE interfaces between the Employer/Engineer and the Contractor.

ii) Details the processes by which the Contactor shall manage SHE issues while carrying out the works under the Contract.

2.1.4.3 These requirements shall be read together with OHSAS 18001-1999, Occupational Health and Safety Management System and ISO 14001: 2004 Environmental Management Systems.

2.1.5 'SHE' Targets and Goals

2.1.5.1 The SHE targets, goals and aim for the Works are to achieve:

i) Zero total recordable injuries

ii) Zero reportable environmental incidents

iii) Induction of all personnel in accordance with the approved Contactor SHE plan

iv) Total compliance of conducting inspections and audits as per approved SHE plan

v) 100% incident recording and reporting

vi) 100% adherence of usage of appropriate PPEs at work.

vii) Executing construction work with least disturbance to the environment, adjoining road users and traffic.

2.2 COMPLIANCE

2.2.1 Employer's Policy on Labour Protection

The Contractor shall implement THE EMPLOYER's Policy on Labour Protection for carrying out all the construction works under this contract whether directly or through a Sub-contractor or through any other agency. A copy of the Policy is attached as Attachment 6 [Workplace Policy on Labour Protection] to Appendix 2.

2.2.2 Indian statutory requirements

2.2.2.1 The Contractor shall develop a thorough understanding of Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, Central Rules 1998, Building and other Construction Workers' Welfare Cess Act, 1996 and Central Rules, 1998, not only to satisfy the Inspectors' perspective but the use of legislation as the strong tool for effective SHE management at construction worksites. The Contractor is strongly advised to practice the principle of voluntary compliance.

2.2.2.2 In order to facilitate the Contactor for better understanding on the various provisions of the above Act and Rules, a tabulated information highlighting the Sections/Rules referring to the corresponding registration of contractors, maintenance of registers and records, hours of work and wages, welfare, medical facilities and safety requirements are given in Attachment 3 [Safety, Welfare and Occupational Health Requirements as per BOCW Act 1996] to Appendix 2. It is an indicative one and not a limiting list.

2.2.2.3 In addition, the construction works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:

(1) Indian Electricity Act 2003 and Rules 1956

(2) National Building Code, 2005

(3) Factories Act, 1948 and concerned State Govt. Factories Rules.

(4) Motor Vehicles Act as amended in 1994, The Central Motor Vehicles Rules, 1989, and Motor Vehicle Rules of the concerned State Government as amended from time to time.

(5) Indian Road Congress Code IRC: SP: 55-2001 'Guidelines on Safety In Road Construction Zones.

(6) The Petroleum Act, 1934 and Rules 1976

(7) Gas Cylinder Rules, 2003

(8) Indian Explosives Act. 1884, along with the Explosives substance Act 1908 and the Explosives Rules 1983

(9) The (Indian) Boilers Act, 1923

(10) The Public Liability Insurance Act 1991 and Rules 1991

(11) Minimum Wages Act, 1948 and Rules 1950

(12) Contract Labour (Regulation and Abolition) Act, 1970 and Rules 1971

(13) Child Labour (Prohibitions & Regulations) Act, 1986 and Rules 1950

(14) Environment Protection Act, 1986 and Rules 1986

(15) Indian Wildlife (Protection) Act 1972, and its subsequent amendments

(16) Forest (conservation) Act 1980 and rules thereunder

(17) Air (Prevention and control of Pollution) Act, 1981

(18) Water (Prevention and Control of Pollution) Act, 1974

(19) The Noise Pollution (Regulation & Control) Rules, 2000

(20) Notification on Control of Noise from Diesel Generator (DG) sets, 2002

(21) Recycled plastics Manufacture and Usage Rules 1999

(22) Ground Water (Regulation, Development and Management) Rules 2007

(23) Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989

(24) The Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules 2008 and its amendment

(25) Chemical Accidents (Emergency Planning, Preparedness and Response) Rules 1996

(26) Batteries (Management and Handling) Rules

(27) Payment of Wages Act, 1936;

(28) Equal Remuneration Act, 1976;

(29) Employees Provident Fund and Miscellaneous

(30) Provisions Act, 1952;

(31) Payment of Gratuity Act, 1972;

(32) Employees State Insurance Act, 1948;

(33) Payment Of Bonus Act, 1965;

(34) Maternity Benefit Act, 1951;

(35) Industrial Disputes Act, 1947;

(36) Industrial Employment (Standing Orders) Act, 1946;

(37) Trade Unions Act, 1926;

(38) Building and other Construction Workers (Regulation of Employment of Service) Act of 1996;

(39) Inter State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act ,1979;

(40) Workmen Compensation Act. 1923;

(41) Mines Act, 1952.

2.2.2.4 Notwithstanding the above Act/Rules, there is nothing in those to exempt the Contractor from the purview of any other Act or Rule in Republic of India for the safety of men and materials.

2.2.2.5 If the requirements stated in this document are in conflict or inconsistent with the requirements of applicable laws, the more stringent requirements shall apply.

2.2.3 International Standards, Guidelines & ISO Certifications

2.2.3.1 The works should be undertaken in accordance with the applicable international guidelines, standards and specifications on SHE and the Contractor shall be accredited under the following schemes:

OHSAS 18001-2007: Occupational Health and Safety Management System.

ISO 14001-2004: Environmental Management Systems.

2.2.3.2 The process of certification shall start immediately after the award of the work and complete within reasonable minimum time. Towards this, the contractor shall undertake the required steps including appointment of ISO consultant suggested in the General Instruction DFCCIL/SHE/GI/010 in Attachment 7 [Reference for SHE Activities] to Appendix 2 for obtaining the certification on Occupational Health and Safety Management System and Environment Management System.

2.2.3.3 The Contactor is free to choose any ISO consultant of his choice other than the listed ISO consultants, however he shall demonstrate the competency of the consultant and obtain the Engineer/ Employer's approval.

2.2.3.4 In case of contractors along with the joint venture partners, who possess a valid certification of either ISO 14001 or OHSAS 18001 or both shall include DFCCIL contract in their immediate following surveillance audit which normally takes place at the interval stipulated in those practices. The required documentation shall be undertaken with the help of the ISO consultant. If the same can be done in-house the same shall be demonstrated to the Engineer/ Employer. If any of the JV partners do not possess the ISO 14001 or OHSAS 18001 certification then the Contractor shall obtain a fresh certification.

2.2.3.5 In case of failure on the part of the Contractor, the Engineer/ Employer at the cost of the Contactor shall do the same.

2.2.4 Contractor's Statutory Obligations

2.2.4.1 The obligations and requirements for safety, environment and health under this Contract are entirely without prejudice to, and do not release the Contractor from his statutory obligations with respect to safety, environment and industrial health.

2.3 RISK ASSESSMENT AND METHOD STATEMENTS

Risk Assessment shall be conducted by the Contractor for all works to decide on priorities and to set objectives for eliminating hazards and reducing risks.

2.3.1 The Risk Assessment Process

2.3.1.1 The following six elements shall be considered during the assessment process:

i) hazard identification

ii) persons at risk

iii) evaluation of risk level

iv) risk controls (existing and additional)

v) record of risk assessment findings

vi) monitoring and review

2.3.2 Hazard Identification

2.3.2.1 A tour of the area under consideration by the risk assessment team is an essential part of hazard identification including consultation with the relevant workforce. It is important that unsafe conditions are not confused with hazards, during hazard identification.

2.3.3 Persons at Risk

2.3.3.1 On a construction site, the persons at risk could be site operatives, surveyors, transport drivers, other visitors and the general public. The risk assessment shall include any additional controls required due to the vulnerability of any of these groups, perhaps caused by inexperience or disability.

2.3.4 Evaluation of Risk Level

2.3.4.1 The purpose of the risk assessment, therefore, is to reduce the remaining risk after taking into consideration of risks already addressed. This is called the residual risk.

2.3.4.2 The goal of risk assessment is to reduce all residual risks to as low a level as reasonably practicable. In a relatively complex workplace, this will take time so that a system of ranking risk is required – the higher the risk level the sooner it shall be addressed and controlled. For most situations, a qualitative risk assessment will be perfectly adequate. For all high risk activities a quantitative risk assessment shall be conducted to quantify the risk level in terms of the likelihood of an incident and its subsequent severity. Clearly the higher the likelihood and severity, the higher the risk will be. The likelihood depends on such factors as the control measures in place, the frequency, the exposure to the hazard and the category of person exposed to the hazard. The severity will depend on the magnitude of the hazard (e.g. voltage, toxicity etc.).

2.3.5 Risk Control Measures

2.3.5.1 Hierarchy of Risk Control

When assessing the adequacy of existing controls or introducing new controls, a hierarchy of risk controls should be considered. The principles are:

i) avoiding risks

ii) evaluating the risks which cannot be avoided

iii) combating the risks at source

iv) adapting the work to the individual, especially as regards the design of the workplace, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work – rate and to reducing their effects on health

v) adapting to technical progress

vi) replacing the dangerous by the non-dangerous or the less dangerous

vii) developing a coherent overall prevention policy which covers technology, organization of work, working conditions, social relationships and the influence of factors relating to the working environment

viii) giving collective protective measures priority over individual protective measures and

ix) giving appropriate instruction to employees.

2.3.5.2 In addition to the above the following principles shall also to be employed:

i) eliminating

ii) substitution

iii) Engineering controls (e.g. isolation, insulation and ventilation)

iv) reduced or limited time exposure

v) good housekeeping

vi) safe systems of work

vii) Method Statement

viii) Permit to work

ix) training and information

x) personal protective equipment

xi) welfare

xii) monitoring and supervision

xiii) reviews

2.3.5.3 Health and Safety Method Statement

The method statement should take into account the conclusions of risk assessments made under the Management, Control of Substances Hazardous to Health and the Manual Handling Operations Regulations.

2.3.5.4 As a mandatory rule, if potentially hazardous activities are to be undertaken then method statements should be prepared.

2.3.5.5 Typical work which will require method statements includes but not limited to:

i) erection and dismantling of launching girders, scaffolding, temporary support systems, form work and false work, including construction of ROBs/ RUBs

ii) demolition work

iii) excavation work below 1.2 metres

iv) any construction/ refurbishment work, which may affect the functional/ structural stability of such a structure, or any structure located nearby

v) roof work

vi) erection of structures

vii) work on high voltage electrical equipment

viii) entry into and working in confined spaces

ix) hot work

x) work involving highly flammable liquids

xi) construction in close vicinity of existing railway line or a public road including highways

xii) Working at heights

2.3.5.6 The extent and detail of a method statement will depend upon the size and / or complexity of the work, activity or task to be undertaken. A method statement should contain the following:

i) management arrangements, including identified persons with authority

ii) detailed sequence of work operations in a chronological order

iii) drawings and / or technical information

iv) detailed information on plant, equipment, substances etc.

v) inspection and monitoring controls

vi) risk assessments

vii) emergency procedures and systems

viii) arrangements for delivery, stacking, storing and movement of logistics on site

ix) details of site features, layout and access, which may affect the method of working

x) procedures for changing or departing from the method statement.

2.3.5.7 The method statement is a dynamic document and shall be adhered to and kept up to date.

2.3.6 Record of Risk Assessment Findings

All risk assessment statements are to be recorded and maintained. The record should be accessible to auditors and the Engineer and a copy kept with the safety manual containing the safety policy and arrangements.

2.3.7 Monitoring and Review

Risk controls shall be reviewed periodically. Review and revision shall be necessary when conditions change as a result of the introduction of new machinery, processes or hazards. There could also be changes in the workforce, for example, the introduction of trainees. The risk assessment only needs to be revised if significant changes have taken place since the last assessment was done. An accident or incident or a series of minor ones provides a good reason for a review of the risk assessment. This is known as the post-accident risk assessment.

2.4 CONTRACTOR SHE POLICY AND PLAN

2.4.1 The Contractor shall prepare, submit, amend and improve his SHE Policy and SHE Plan and get it approved as detailed in Clause 1.2.2 (Management Plan)

2.4.2 The SHE Plan shall include the following but not be restricted to:

i) A statement of the Contractor's SHE Policy as per Section 39 of BOCWR and bringing out the intent, organization and arrangements for making SHE Policy and Plan effective

ii) The name(s) and experience of person(s) within the Contractor's proposed management who shall be responsible for co-ordinating and monitoring the Contractor's SHE performance;

iii) The number of SHE staff who shall be employed on the Works, their responsibilities, authority and line of communication with the proposed Contractor's agent;

iv) A statement of the Contractor's policy and procedures for identifying and estimating hazards, and the measures for addressing the same;

v) A list of SHE hazards anticipated for this Contract and sufficient information to demonstrate the Contractor's proposals for achieving effective and efficient health and safety procedures;

vi) A statement on Contractor's approach / policy on sub-standard and unsafe Engineering & construction practices and their control

vii) A SHE checklist indicating various aspects to be ensured before taking up different activities

viii) Arrangement of training of workers, supervisors and other staff along with a description of the SHE training courses and emergency drills which shall be provided by the Contractor, with an outline of the syllabus to be followed;

ix) Details of the safety equipment which shall be provided by the Contractor, including personal protective equipment (PPE);

x) A statement of the Contractor's policy and procedures for ensuring that Contractor's Equipment used on the project Site are maintained in a safe condition and are operated in a safe manner;

xi) A statement of the Contractor's policy and procedures for ensuring that sub-contractors comply with the Contractor's safety plan;

xii) A statement of the Contractor's disciplinary procedures with respect to SHE related matters;

xiii) A statement of the Contractor's procedure for reporting and investigating accidents, dangerous occurrences or occupational illnesses;

xiv) A statement of the Contractor's arrangements for appointment of a SHE Committee, especially in compliance with Clause 39 of BOCWR;

xv) A statement of the Contractor's arrangements to provide for welfare facilities for his employees including implementation of Employer's Policy on HIV/AIDS Prevention and Control for Workers engaged by Contractors;

xvi) A statement of the Contractor's arrangements to implement Employer's Policy on Labour Protection;

xvii) Mockup Drills

xviii) Contractor's Emergency Response Plan.

2.4.3 The Contractor shall arrange to carry out revisions, if any, to the SHE Plan (including SHE Policy) within 21 days of receipt of the same from the Engineer.

2.4.4 The Contractor shall, from time to time and as necessary, is required by the Engineer to produce supplements to the SHE Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety, industrial health and environment obligations, responsibilities, policies and procedures relating to work on a site. Any and all submissions of supplements to the SHE Plan shall be made to the Engineer in accordance with the agreed procedures. The Contractor shall also submit a detailed SHE Plan, specific to each site, called hereinafter as the Site SHE Plan, for consent of the Engineer which shall include the requirements of the Safety from Clause 4.1 to 4.25 as given hereinafter.

2.4.5 If at any time during the course of execution of the Work, the SHE Plan in the Engineer's opinion, is insufficient or requires revision or modification to ensure the security of the Works and the safety of all workmen/ visitors in the Work Area, the Engineer may instruct the Contractor to revise the relevant SHE plan and the Contractor shall within 21 days submit the revised plan(s) to the Engineer for review.

2.4.6 Any omissions, inconsistencies and errors in the SHE Plan or the Engineer's acceptance or rejection of the SHE Plan and/or supplements thereto shall be without prejudice to the

Contractor's obligations with respect to site safety, industrial health and environment and shall not be an excuse for any failure by the Contractor to adopt proper and recognized safety practices throughout the execution of the Work and also shall not be a reason for extension of completion time of the project.

2.4.7 The Contractor shall adhere to the SHE Plans and shall ensure that all sub-contractors of all tiers require that contracting parties each have a copy of the relevant Site SHE Plan and comply with its provisions.

2.4.8 The details of contents to be covered in the SHE plan are given in Attachment 4 [Content of Contractor's SHE Plan] to the Appendix 2.

2.4.9 The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer to carry out surveillance to verify that the Site SHE Plan is being properly and fully implemented.

2.5 Role of Design Team in Contractor's Organization

2.5.1 Role of Design Team in Safety, Health and Environment

2.5.1.1 In this design-build Contract, the Contractor has a design Team in his project organization and the Design Team's primary role includes to minimize the risk to health and safety of those who are going to construct, maintain, clean, repair, dismantle or demolish the structures and others like adjoining road users/general public, who might be affected by the work.

2.5.2 General philosophy

2.5.2.1 When considering health and safety in the Design Team's work, they shall be expected to do what is reasonable at the time the design is prepared. It may be possible for hazards, which cannot be addressed at the feasibility stage to be looked at during detailed design. In deciding what is reasonably practicable, the risk to health and safety produced by a feature of the design has to be weighed against the cost of excluding the feature. The overall design process does not need to be dominated by a concern to avoid all risks during the construction phase and maintenance. However, a judgment has to be made by weighing up one consideration against another so the cost is counted not just in financial terms, but also those of fitness for purpose, aesthetics, buildability or environmental impact. By applying these principles, it may be possible to make decisions at the design stage, which will avoid or reduce risks during construction work. In many cases, the large number of design considerations will allow a number of equally valid design solutions. What is important is the approach to the solutions of design problems. This should involve a proper exercise of judgement, which takes account of health and safety issues.

2.5.3 Hierarchy of Risk Control

2.5.3.1 The Design Team shall need, so far as reasonably practicable, to avoid or reduce risks by applying a series of steps known as the hierarchy of risk control or principles of prevention and protection. The steps to be adopted shall include but not limited to the following:

i) consider if the hazard can be prevented from arising so that the risk can be avoided (e.g., alter the design to avoid the risk);

ii) if this cannot be achieved, the risk should be combated at source (e.g., ensure the design details of items to be lifted include attachment points for lifting);

iii) failing this, priority should be given to measures to control the risk that will protect all people;

iv) only as a last resort should measures to control risk by means of personal protection be assumed (e.g., use of safety harnesses).

2.5.4 Duty to provide health and safety risks in the drawing itself

2.5.4.1 In case of situations where the Design Team has carried out the design work and concluded that there are risks, which were not reasonably practicable to avoid, detailed information shall be given about the health and safety risks, which remain. This information needs to be included with the design to alert others to the risks, which they cannot reasonably be expected to know. This is essential for the parties who have to use the design information.

2.5.4.2 If the Design Team's basic design assumptions affect health or safety, or health and safety risks are not obvious from the standard design document, the Design Team shall provide additional information. The information shall include a broad indication of the assumptions about the precautions for dealing with the risks. The information will need to be conveyed in a clear manner; it shall be included on drawings, in written specifications or outline method statements. The level of detail to be recorded will be determined by the nature of the hazards involved and the associated level of risk.

2.5.5 Engineer's Consent

2.5.5.1 Every structure like scaffold, false work, launching girder, earth retaining structures etc. shall have its design calculations included in the method statements in addition to health and safety risks. The Engineer shall examine and communicate his consent as per the contract conditions.

2.5.5.2 Any non-standard structures like trestles made up of re-bars or structures which are very old, corroded, repaired for many times etc. for which no design calculations can be made accurately from any national standards, shall not be allowed to be used at sites even for short duration.

2.6 CONTRACTOR's SHE ORGANISATION

2.6.1 Education and Experience

2.6.1.1 The Contactor shall appoint adequate numbers of the required SHE personnel keeping in view the General Instruction DFCCIL/SHE/GI/001 and DFCCIL/SHE/GI/002 as indicated in Attachment 7 [Reference for SHE Activities] to Appendix 2 for reference and based upon the statutory requirement and establish the SHE organization appropriate to the size and complexity of the project.

2.6.1.2 As stated herein before, the safety discipline of SHE organization shall be headed by the Chief Accident Prevention Officer (CAPO). He shall work full time on the Work and be responsible for all aspects of safety of the Works including implementation of the Safety Plan in accordance with the Safety Programme as well as occupational health, traffic management, housekeeping and labour welfare.

2.6.1.3 In order to effectively implement the requirements herein and to interact on safety and labour welfare matters with and the statutory authorities enforcing the safety and labour welfare legislations as well as the Engineer, the Contractor shall employ adequate numbers of full time Safety and Labour Welfare Officers duly qualified and experienced as per clause 2.6.1.1.

2.6.1.4 The CAPO shall be assisted by an adequate number of Safety Officers. One of the Safety Officers shall be designated as Deputy Chief Accident Prevention Officer. This Dy CAPO shall be capable to look after the duties and responsibilities of CAPO during the absence of the latter.

2.6.1.5 The Contractor shall not undertake any works on the Site until the CAPO has commenced duties at Site and unless the Engineer has specifically consented in writing.

2.6.1.6 The Contractor shall not remove the Safety Officer from the site without permission of the Engineer. Within fourteen (14) days of any such removal or notice of intent of removal, the Contractor shall nominate a Safety Officer to replace for the Engineer's consent.

2.6.1.7 The Contractor shall empower the Safety Officer and safety staff to instruct his employees or of its sub-contractors of any tiers to cease operations and take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the Site SHE Plan or the statutory regulations.

2.6.1.8 The Contractor shall ensure that the Safety Officer maintains a daily site safety diary, such diary comprehensively recording all relevant matters concerning site safety, safety inspections and audits, safety related incidents and the like.

2.6.1.9 The site safety diary shall be reviewed and signed on a weekly basis by the Contractor's Site Representative and shall be available at all times for inspection by the Engineer.

2.6.1.10 The Contractor's Staff Organization Plan shall show direct lines of communication and reporting between the CAPO and the Contractor's Site Representative and between the CAPO and the SHE director responsible for the Contract.

2.6.2 Conduct and competency

The Contractor shall ensure that all the Contractor's Personnel are competent to perform the job assigned to them. In the event that the Contractor is unable to demonstrate the competency of any person whose activities can directly impact on the Works' SHE performance, the Engineer shall have the authority to remove that person from the site without any procedural formalities.

2.6.3 Engineer's Consent

2.6.3.1 The name, address, educational qualification, work experience and health condition of each personnel deployed for SHE jobs shall be submitted to the Engineer in the format prescribed for the purpose for comments and obtaining his consent well before the start of the work. Only on receipt of consent by the Engineer, these personnel are authorised to work. In case any of the SHE personnel leaves the Contactor the same shall be intimated to the Engineer immediately. The Contactor shall also employ the new personnel as per the aforesaid procedure.

2.6.4 Responsibility of SHE personnel

2.6.4.1 For all works carried out by the Contractor and his sub-contractors, the responsibility of ensuring the required SHE manpower lies with the main Contractor only. The minimum required manpower indicated by the Employer shall include the sub-contractors' workers also. It shall be the responsibility of the Contractor to provide required SHE manpower for all the works executed by all his sub-contractors. Necessary conditions shall be included in all sub-contract documents executed by the Contractor.

2.6.5 Employment status of SHE personnel

2.6.5.1 No contractor shall engage SHE manpower from any outsourcing agencies in which case the effectiveness would be lost. All SHE manpower shall be on the payroll of the main Contractor only and not on the payroll of any sub-contractor or outsourcing manpower agencies, etc. This condition does not apply to positions like traffic marshals who are engaged almost on a daily requirement basis.

2.6.6 Reporting of SHE personnel

2.6.6.1 All SHE personnel in the Environmental Team shall report to the Chief Environmental Officer and all SHE personnel in the Health and Safety Team shall report to the Chief Accident Prevention Officer. These Chief Environmental and Accident Prevention Officers shall report directly to the Contractor's Representative and the Engineer. The Engineer shall monitor adherence to this procedure at all times.

2.6.7 Inadequate SHE personnel

2.6.7.1 In case the Contractor fails to provide the minimum required manpower, or fail to fill up vacancies created within 14 days, the same shall be provided by the Engineer at the Contractor's cost. Any administrative expenses involved to provide the same, like, paper

advertisement or manpower consultant charges, etc, shall also be at the cost of the Contractor.

2.6.8 Prohibition of performance of other duties

2.6.8.1 No SHE personnel shall be required or permitted to do any work which is unconnected to, inconsistent with or detrimental to the performance of the SHE duties which were stipulated in the SHE Plan and other detailed plans that defined SHE activities as have been submitted to and consented by the Engineer.

2.6.9 Facilities to be provided to SHE personnel

2.6.9.1 The contractor shall provide all SHE personnel with such facilities, equipment and information that are necessary to enable him to dispatch his duties effectively.

2.6.9.2 The minimum Employer's Requirements of such facilities / equipments to be provided for SHE personnel are indicated in the General Instruction DFCCIL/SHE/GI/003 in the attachment 7 [Reference for SHE Activities] to Appendix 2.

2.7 CONTRACTOR's SHE COMMITTEE

2.7.1 General

The Contractor shall form and maintain a committee referred to as the SHE Committee being comprised of the Contractor's Personnel as defined and described in the clauses hereinafter.

2.7.2 Terms of Reference

2.7.2.1 The Terms of Reference for the SHE Committee shall be as follows;

i) To establish company safety policies and practices

ii) To monitor the adequacy of the Contractor's SHE plan and ensure its implementation

iii) To review SHE training

iv) To review the Contractor's monthly SHE report.

v) To identify probable causes of accident and unsafe practices in building or other construction work and to suggest remedial measures.

vi) To stimulate interest of Employer and building workers in safety by organizing safety week, safety competition, talks and film-shows on safety, preparing posters or taking similar other measures as and when required or as necessary.

vii) To go round the construction site with a view to check unsafe practices and detect unsafe conditions and to recommend remedial measures for their rectifications including first-aid medical and welfare facilities.

viii) Committee team members should perform a site inspection before every committee meetings and to monitor SHE inspection reports.

ix) To bring to the notice of the Engineer the hazards associated with use, handling and maintenance of the equipment used during the course of building and other construction work.

x) To suggest measures for improving welfare amenities in the construction site and other miscellaneous aspect of safety, health and welfare in building or other construction work.

xi) To look into the health hazards associated with handling different types of explosives, chemicals and other construction materials and to suggest remedial measures including personal protective equipment.

xii) To take punitive action against erring Contractor's agents / Engineers at Site who do not heed to the advise on SHE aspects

xiii) To review the last safety committee meeting minutes and to take action against persons/sub-contractors for non-compliance if any.

2.7.2.2 Within 84 days of the Commencement Date, the SHE Committee shall be constituted and notification regarding the same shall be communicated to the members and employees as per the format provided in Form No.: SF 001 as attached in the Attachment 7 [Reference for SHE Activities] to Appendix 2.

2.7.2.3 Project SHE Committee meeting shall be conducted at least once in a month with the minimum members listed below:

Chairman	Contractor's Representative
Secretary	SHE Director
Members	i) Chief Accident Prevention Officer ii) Chief Environmental Officer iii) Labour Welfare Officer iv) Senior Managers/ Engineers heading different functions v) Sub – contractor's representative vi) Workers' representative
Employer's Representatives	i) The Engineer ii) DFCCIL SHE in charge and other representatives

2.7.2.4 Site SHE Committee meeting shall be conducted at least once in a week with the minimum members listed below:

Chairman	Contractor's Representative for the site
Secretary	Accident Prevention Officer Senior Environmental Officer
Employer's Representatives	Engineer's representative for the Site
Members	Sub- Contractor's representative Workers' representatives SHE Staff

2.7.3 Other Contractors' Participation

2.7.3.1 In case of depot, station and other contiguous areas where more than one main contractors are working together, the Engineer shall instruct the Other Contractors to join for the monthly SHE committee meeting of the Contractor, so as to discuss and decide about the common provision of security, lighting, toilet, drinking water etc. and sharing the maintenance cost of the same etc.

2.7.3.2 The general principle for sharing the cost shall be based on the contract value of works executed at the contiguous area, the daily average number of workmen employed by each contractor in the contiguous area, or other pertinent criteria if applicable and mutually agreed upon. In case of any disagreement, the Engineer's decision shall be final & binding

2.7.4 Minimum time between two monthly SHE Committee meetings

2.7.4.1 A minimum period of 21 days shall be maintained between any two SHE monthly committee meetings.

2.7.5 Agenda

2.7.5.1 The Secretary shall circulate the agenda of the meeting at least three (3) working days in advance of the scheduled date of the meeting to all members.

2.7.5.2 The agenda should broadly cover the following:

i) Confirmation of minutes

ii) Chairman's review/overview of site SHE performance / condition

iii) Previous month SHE statistics

iv) Incident and Accident Investigation / dangerous occurrence / near miss report

v) Site SHE inspection

vi) Sub-contractors' SHE issues

vii) Safety presentation by Members

viii) Report from the Engineer

ix) Matters arising

x) Any other business

2.7.6 Minutes of the meeting

2.7.6.1 The Minutes of the meeting shall be prepared as per the format provided at Form SF- 002 in Attachment 7 [Reference for SHE Activities] to Appendix 2 and sent to all members within 2 working days preferably by mail/fax followed by hardcopy. Safety Committee meeting minutes shall also be displayed in the notice board for wider publicity to all concerned.

2.8 ID CARD AND FIRST DAY AT WORK, SHE ORIENTATION TRAINING

2.8.1 The Contractor shall ensure that all personnel working at the site receive an induction SHE training explaining the nature of the work, the hazards that may be encountered during the site work and the particular hazards attached to their own function within the operation. The training shall cover the contents as suggested in the General Instruction DFCCIL/SHE/GI/004 in Attachment 7 [Reference for SHE Activities] to Appendix 2.

2.8.2 All Contractor's Personnel shall be issued a photo identity card of size 85mm x 55mm duly signed by the authorized representative of the Contractor before they are engaged for any work as per the format indicated in the General Instruction DFCCIL/SHE/GI/005 in Attachment 7 [Reference for SHE Activities] to Appendix 2.

2.8.3 The Contractor shall also issue a personnel SHE handbook in a language known to the workers, which provides information on SHE and emergency procedures that all personnel involved in the Work are required to know and the need to follow. The Contractor shall ensure that this is distributed and its content introduced to all personnel working in the Work Area.

2.9 SHE TRAINING

2.9.1 The behaviour of people at all levels of the contractors is critical for SHE performance.

2.9.2 The Contractor shall organize quality SHE training to engage Managers, supervisors and other personnel in behavioural change and improve safety performance.

2.9.3 The Contractor shall analyse the training requirements for all the employees and initiate a training program to demonstrate that all persons employed, including subcontractors, are suitably qualified, competent and fit. This will include:

i) Detailed Job descriptions for all personnel, to include their specific SHE responsibilities

ii) Specification of qualifications, competency and training requirements for all personnel

iii) Assessment and recording of training needs for all personnel, including subcontractors' employees in the workforce, vendor representatives and site visitors

iv) A system for assessing new hirers e.g. previous training

v) A means of confirming that the system is effective

vi) A matrix and schedule of training requirements, covering general, task–specific and SHE-related training, showing the training frequency and interval between refresher courses

vii) Timely, competent delivery of training courses

2.9.4 The Contractor shall arrange behavioural-based training programmes for all the executives to identify, recognize and eliminate unsafe act and unsafe conditions.

2.9.5 The minimum Employer's requirement of training needs for various categories of employees are suggested in General Instruction DFCCIL/SHE/GI/006 in Attachment 7 [Reference for SHE Activities] to Appendix 2.

2.9.6 The contents of SHE training to Managers/Supervisors as given in General Instruction DFCCIL/SHE/GI/007 in Attachment 7 [Reference for SHE Activities] to Appendix 2 shall be conducted.

2.9.7 The refresher-training programme to all employees shall be conducted once in six months.

2.9.8 On-job training by way of Toolbox talk shall be conducted to all high-risk workmen everyday.

2.9.9 On-the spot practical skill development training on height safety including scaffold & formwork safety, crane safety, welding safety, electrical safety, work adjacent to tracks/ roads and traffic safety for marshals, shall also be conducted to all foremen/ workmen who were associated to the concerned jobs.

2.9.10 Daily Safety Oath shall be taken by every employee including workman.

2.9.11 All vehicle drivers including Hydra operators shall be trained on defensive driving at Automobile Association of Western India or other organization identified by the Employer. All vehicle drivers shall also undergo refresher training on defensive driving provided by the same institute once in 6 months.

2.9.12 All the above listed training programmes except at clause 2.9.11 shall be organized by the Contractor only after taking approval from the Engineer for the training faculty / organization, content and durations. Some of the agencies are listed in DFCCIL/SHE/GI/010 in Attachment 7 [Reference for SHE Activities] to Appendix 2, which may be referred.

2.9.13 In case of failure on the part of the Contractor to provide all the above-mentioned training programs to all employees in time, the same shall be provided by the Employer through accredited agencies if required by formulating a common scheme to all contractors. It is mandatory for the contractors to participate in the common scheme. Any administrative expenses and training fee towards the same shall be at the cost of the Contractor.

2.9.14 Mock up Drills shall be carried out at a pre-defined intervals and the analyses report submitted to SHE Committee.

2.10 SHE INSPECTION

2.10.1 General

2.10.1.1 The Contractor shall evolve and administer a system of conducting SHE inspections and other risk management analysis on a periodical basis.

2.10.1.2 The purpose of SHE inspection is to identify any variation in construction activities and operations, machineries, plant and equipment and processes against the SHE Plan and its supplementary procedures and programs.

2.10.1.3 Following SHE inspections program shall be adopted.

i) Planned General Inspection

ii) Routine Inspection

iii) Specific Inspection

iv) other Inspection

2.10.2 Planned General Inspection

2.10.2.1 Planned general inspections are performed at predetermined intervals and it usually involves the representation from both Contractor and the Employer/ Engineer.

2.10.2.2 Inspections that will be classified under this inspection program are:

i) Monthly Contractor and subcontractor's site safety committee Inspection.

ii) Weekly safety inspection by construction supervisors (Contractors and Sub-contractors).

iii) Daily safety inspection by the SHE teams (Health and Safety Team and Environmental Team).

2.10.3 Routine Inspection

2.10.3.1 Routine inspections are often referring to the inspection of Work Area, equipment and temporary structures performed by site and equipment operators and temporary structure erectors.

2.10.3.2 Inspections that will be classified under this inspection program are:

i) Daily Inspection of plant and equipment by operator

ii) Weekly Inspection of scaffold by scaffolding supervisor

iii) Monthly Inspection of electrical hand tools by competent electrical supervisor

iv) Quarterly Inspection of temporary electrical and mechanical systems by competent supervisor

v) Half-yearly inspection of lifting machinery, lifting appliances, equipment and gears by Govt. approved competent person.

2.10.3.3 The list mentioned above is not exhaustive. Contractor may add additional categories. Contractors' site SHE Officers and Managers will ensure that a system of routine inspections are carried out periodically to all plants, equipment, powered tools and any other temporary structures that will pose a hazard to operators and workmen.

2.10.4 Specific Inspection

2.10.4.1 Specific inspections are performed on activities without a predetermined date. Competent supervisors usually perform inspections for ensuring an activity whether it is executed in accordance to a general set of rules; method statement submitted or developed procedures.

2.10.4.2 The following are examples that will be commonly performed as required on the construction site:

i) Inspection performed before a heavy lifting operation.

ii) Inspection performed before and after the entry of person into a confined space.

iii) Inspection performed before and after a welding and gas cutting operation.

iv) Inspection of formwork before concreting by formwork erector.

v) Inspection of temporary earth support systems before and after excavation

2.10.4.3 The list mentioned above is not exhaustive. The Contractor shall ensure that a competent supervisor inspects all high-risk processes and activities.

2.10.5 other Inspection

2.10.5.1 other inspections includes the following:

i) Mandatory Inspections by Labour Department of Government.

ii) Employer's site SHE management team

iii) Air and noise Quality Monitoring and Inspection

2.10.5.2 The Contractor shall prepare all required safety inspection checklist for all activity operations and equipment. Checklists will be prepared based on the Indian standards, rules and regulations and Employer's Requirements.

2.10.5.3 All inspection records and reports will be properly kept and filed for audit purpose. Inspection reports of Planned General Inspection and Routine Inspection will be used for discussion during Safety Committee Meetings.

2.10.5.4 The Engineer reserves the right to order the immediate removal and replacement of any item of Contractor's Equipment or Temporary Works which, in his opinion, is unsatisfactory for its purpose or is in an unsafe condition.

2.11 SHE AUDIT

2.11.1 General

2.11.1.1 The purpose and scope of SHE audit is to assess potential risk, liabilities and the degree of compliance of construction Safety, Health and Environmental plan and its supplementary procedures and programs against applicable and current SHE legislation regulations and requirements of the Employer.

2.11.1.2 The Contractor's Representative holds the ultimate responsibility in ensuring implementation of SHE audit program during the construction work.

2.11.2 Monthly Audit Rating Score (M A R S)

2.11.2.1 Monthly Audit Rating Score (MARS) will be performed once in a month. A team consisting of Contractor's Representative and the Engineer based on the pre-designed score-rating format will conduct it.

2.11.2.2 This Monthly SHE Audit Rating Score (MARS) report will enable the Engineer to evaluate the general compliance by the Contractor with the Conditions of Contract and the Contractor's site specific SHE Plan.

2.11.2.3 Monthly Audits will be conducted in accordance with DFCCIL guidelines. The Contractor's senior manager and SHE in-charge should also be invited to attend.

2.11.2.4 The Monthly Audit Rating Score (MARS) should be conducted at least 7 days prior to the scheduled date of Monthly SHE Committee meeting.

2.11.2.5 The numerical scoring has been weighed on a 1-10 scale. The audit team will use their observations noted in evaluating the points to be awarded against each of the elements of the audited section. Wherever some topics and sub-topics are not applicable the score rating need not be given. The overall audit ratings shall be achieved by:

$$\text{Overall Audit rating} = \frac{\text{Actual Score Achieved}}{\text{Maximum Possible Score}} \times 100$$

2.11.2.6 The criticality of the required actions for the respective sections of the Audit will be classified as :

Sl. No.	Score	Description	Action
1	< 60%	Immediate	Require Contractor to rectify within 24 hours
2	< 75%	Improvement Necessary	Contractor rectification within 7 days and confirmed in writing to the Engineer
3	< 90%	Improvement Desirable	Contractor rectification within one month and confirmed in writing to the Engineer

2.11.2.7 A copy of each Audit Report will be sent to the Engineer, the Employer and to all subcontractors, with whom it will then be discussed in detail at the Monthly SHE Committee Meeting in order to ensure that any corrective actions are agreed upon.

2.11.3 Monthly Electrical Safety Audit

2.11.3.1 A team comprising of the Contractor's senior SHE (Electrical) Engineer and the Engineer shall conduct monthly electrical safety audit covering the following and submit the report to the Engineer and the Employer. A monthly electrical audit format shall be designed by the Contractor with consent of the Engineer for this purpose.

i) Electrical accidents investigation findings and remedy

ii) Adequacy of power generation and power requirements

iii) Power distribution and transmission system in place

iv) Updated electrical single line diagram showing the current condition of power source and distribution including the IP44 DBs arrangement.

v) Electrical protection devices – selection, installation and maintenance.

vi) Earth or ground connection and earth pit maintenance details

vii) Education and training of electrical personnel undertaken

viii) Routine electrical inspection details

ix) Safety Certificate in respect of Contractor's electrical systems and equipment

x) Electrical maintenance system and register.

xi) Name plate details of major electrical equipment

xii) Classified zones in the site, if any.

2.11.4 External SHE Audit

2.11.4.1 External SHE audits are to be conducted by external agency appointed by the Employer that are competent with ISO qualified auditors with prior approval of the Employer.

2.11.4.2 The audit team shall have a practical understanding of BOCW Act and Rules, statutory requirements on health/medical and welfare of workmen, construction hazards and its prevention and control, traffic management, electrical safety, rigging, safety of construction equipment and environment management.

2.11.4.3 Audit shall be conducted on quarterly basis as per the guidelines of ISO, ILO, and national standards. Audit report shall also be presented as per the above formats.

2.11.4.4 The contents and coverage of the external audit shall include the following items:

SHE management:

i) Organization

ii) Communication and Motivation

iii) Time office

iv) Inspection

v) Emergency preparedness

vi) Budget allocation

vii) Education and Training

viii) Work permit system

Technical:

i) Building and Structure

ii) Construction operational safety

iii) Material safety

iv) Hand tools and Power tools

v) Electrical system

vi) Safety Appliances

vii) Fire prevention and control

viii) Housekeeping

ix) Maintenance and Machinery safety

x) First-aid and Medical Facilities

xi) Welfare measures

xii) Environmental Management

2.11.4.5 Contractor shall make the below listed documents available for the review by the Audit team.

i) SHE policy

ii) SHE manual

iii) SHE Rules and Regulation

iv) SHE organization chart

v) Annual SHE objectives / programs

vi) Accident / near miss statistics and analysis

vii) SHE Training program / records for all personnel

viii) Operating manuals and maintenance manual of all equipments

ix) Safe worthiness certificates of all lifting appliances and gears

x) Medical fitness record for all personnel

xi) Risk identification, assessment and control details

xii) Environmental management reports

xiii) Emergency management records including mock drill

2.11.4.6 Audit team members are required to gather information by observations through interviews

and by checks of hardware and documentation.

2.11.4.7 Audit team shall prepare checklist to cover all parts based on SHE legislations rules and regulations and the DFCCIL Requirements.

2.11.4.8 Audit team members shall verify the facts and findings leading to the identified gaps and weakness.

2.11.4.9 Audit leader has overall responsibility for reaching a conclusion.

2.11.4.10 Audit report shall be prepared and directly sent to the Engineer and Employer within 7 days after conducting the audit with a copy to the Contractor.

2.11.4.11 The Audit Report shall have the following contents:

i) Executive summary - based on the finalized checklists as written the findings to the Employer by the audit team members, the audit leader will compile a concise and accurate summary of observations and findings.

ii) Introduction - this will contain basic information regarding the facilities or organization audited, the specific audit dates (inclusion of those for preparation and post-audit activities).

iii) Principal positive findings - This will contain the summary of positive aspects as observed by the auditors. It will also contain highlights of those issue, which may warrant dissemination as best practice regarding methodology used or achievement.

iv) Audit Findings - All audit findings as detailed in the audit checklists shall be grouped together as priority 1 and 2 as detailed below in a separate listing.

v) Priority 1: Actions to rectify gaps or weakness should generally be implemented within two-weeks time, if risk potential is high or unacceptable.

vi) Priority 2: Actions should be generally implemented or rectified with a maximum of 3 – 4 weeks, if not rectified would create a likelihood of minor injury or business loss.

2.11.4.12 The auditor shall inspect the site after 14 days of conducting initial audit for checking the adequacy of implementation of items maintained under priority 1 by the Contractor and shall submit a conformity / non-conformity report to the Engineer and the Employer with a copy to the Contractor.

2.11.4.13 The auditor shall again inspect after 28 days of conducting initial audit for checking the adequacy of implementation of items mentioned under priority 2 by the contractor and shall submit a conformity / non-conformity report to the Engineer and Employer with a copy to the Contractor.

2.11.4.14 In case of non-conformity of items mentioned by auditor, the Engineer/ Employer shall take necessary steps including stoppage of work. If the Contractor fails to conduct the external SHE audit in time, the Employer at the cost of the Contractor shall have it done.

2.12 SHE COMMUNICATION

2.12.1 The Contractor shall make every effort to communicate the Safety, Occupational Health and Environment management measures through posters campaigns / billboards / banners / glow signs being displayed around the work site as part of the effort to raise safety awareness amongst to the work force. Posters should be in Hindi, English and a suitable prominent local language if it is other than Hindi. Posters / billboards / banners/ glow signs should be changed at least once in a month to maintain the impact.

2.12.2 The Contractor shall also observe important days as listed in General Instruction DFCCIL/SHE/GI/008 and printing and displaying safety signage and posters as listed to be referred in General Instruction DFCCIL/SHE/GI/009 in Attachment 7 [Reference for SHE Activities] to Appendix 2.

2.12.3 The list indicated are the minimum indications of the Employer and the Contractor is encouraged to further the SHE communication activities by formulating suitable reward schemes for safety performers and any other activities, which deem fit for the purpose.

2.13 SHE SUBMITTALS TO THE ENGINEER / EMPLOYER

2.13.1 Reporting

The Contractor shall send the following reports to the Engineer and the Employer periodically:

i) Daily Reporting of total no of workmen (as given in Clause 2.13.2)

ii) Monthly SHE Report (as given in Clause 12.3.3)

iii) SHE Committee Meeting Minutes (as given in Clause 2.7.6)

iv) SHE Inspection Reports

v) SHE Audit Reports

  a) Monthly Audit Rating Score (MARS) report

  b) External SHE Audit

  c) Electrical Safety Audit

vi) Air and Noise Quality monitoring report

2.13.2 Daily Reporting of Total nos. of Workmen

The Contractor shall report to the Engineer the total nos. of workmen engaged by all including any subcontractor within 2 hours of starting of any shift in any day. This reporting shall be the primary duty of the Chief Accident Prevention Officer of the Contractor and reporting shall be through tele-fax / email. The onus of checking the receipt of the same by the Engineer lies with the Contractor.

2.13.3 Monthly SHE Report

The Contractor shall prepare a monthly SHE report consisting of the following and submit 3 copies within 7th of the next month to the Engineer.

i) Monthly man-hour details

ii) Monthly accident / incident details

iii) SHE Committee details

iv) Details of SHE training conducted in the month

v) SHE Inspection

vi) SHE internal audit details like electrical audit etc.

vii) SHE Communication activities under taken in the month indicating the number of posters displayed and balance availability in stock.

viii) Air quality / Noise monitoring details

ix) Any pollution issue reported

x) Toolbox talks details

xi) PPE details: Quantity purchased, issued to the workmen and stock available.

xii) Details on IP 44 panel boards, lighting poles, welding and cutting equipments, ladders, hoists, tools & tackles.

xiii) Monthly Lux meter study results

xiv) Housekeeping

xv) Barricade maintenance details

xvi) Nos. of critical excavations

xvii) Health & Welfare activities

xviii) Safety walk conducted by Contractors' Representative in the month

xix) SHE Activities Planned for the next month

2.14 ACCIDENT REPORTING AND INVESTIGATION

2.14.1 Reporting to the Engineer and the Employer

2.14.1.1 All accidents and dangerous occurrences shall immediately be informed verbally to the Engineer and the Employer. This will enable the Engineer/ Employer to reach the scene of accident / dangerous occurrences to monitor/assist any rescue work and/or start conducting the investigation process so that the evidences are not lost.

2.14.1.2 Reports of all accidents (fatal / injury) and dangerous occurrences shall also be sent within 24 hours as per a pre-consented format (to be proposed by the Contractor and Engineer's consent obtained).

2.14.1.3 No accident / dangerous occurrences is exempted from reporting to the Engineer/ Employer.

2.14.2 Reporting to Govt. Organizations

2.14.2.1 In addition to the above verbal and written reporting to the Engineer / Employer, as per Rule 210 of BOCWR, notice of any accident to a worker at the building or construction site that: a) causes loss of life; or b) disables a worker from working for a period of 48 hours or more immediately following the accident; shall forthwith be sent by telegram, telephone, fax, or similar other means including special messenger within four hours in case of fatal accidents and 72 hours in case of other accidents, to:

i) the Regional Labour Commissioner (central), wherein the Contractor has registered the firm/work

ii) the Board with which the worker involved was registered as a beneficiary;

iii) Director General, Min. of Labour and

iv) the next of kin or other relative of the worker involved in the accident;

2.14.2.2 Further, notice of accident shall be sent in respect of an accident which: a) causes loss of life; or b) disables the injured worker from work for more than 10 days to:

i) the officer-in-charge of the nearest police station;

ii) the District Magistrate or, if the District Magistrate by order so desires, to the Sub-Divisional Magistrate

2.14.2.3 In case of an accident causing minor injury, first-aid shall be administered and the injured worker shall be immediately transferred to a hospital or other place for medical treatment.

2.14.2.4 Where any accident causing disablement that subsequently results in death, notice in writing of such death, shall be sent to the authorities mentioned in clause 2.14.2.1 and 2.14.2.2 above within 72 hours of such death.

2.14.3 Reporting of Dangerous Occurrences:

2.14.3.1 The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

i) collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of building or construction material or breakage or failure of rope, chain or loose gears; or overturning of cranes used in construction work;

ii) falling of objects from height;

iii) collapse or subsidence of soil, tunnel, pipe lines, any wall, floor, gallery, roof or any other part of any structure, launching girder, platform, staging, scaffolding or means of access including formwork;

iv) explosion of receiver or vessel used for storage of pressure greater than atmospheric pressure, of any gas or gases or any liquid or solid used as building material;

v) fire and explosion causing damage to any place on construction site where building workers are employed;

vi) spillage or leakage of any hazardous substance and damage to their container;

vii) collapse, capsizing, toppling or collision of transport equipment;

viii) leakage or release of harmful toxic gases at the construction site;

2.14.3.2 In case of failure of launching girder, lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances, gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Authorities;

2.14.3.3 Every notice given for fatal accidents or dangerous occurrences shall be followed by a written report to the concerned Authorities under Section 39 of BOCWA and the Director General in the specified Form XIV of BOCWR.

2.14.4 Accident Investigation

General

2.14.4.1 Investigations should be conducted in an open and positive atmosphere that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences

2.14.4.2 Accidents and Dangerous Occurrences which result in death, serious injury or serious damage shall be investigated by the Contractor immediately to find out the cause of the accident/occurrence so that measures can be formulated to prevent any recurrence.

2.14.4.3 Near misses and minor accidents should also be investigated by the Contractor as soon as possible as they are signals that there are inadequacies in the safety management system.

Procedure of incident investigation

2.14.4.4 It is important after any accident or dangerous occurrence that information relating to the incident is gathered in an organized way. The following steps shall be followed;

i) take photographs and make sketches

ii) examine involved equipment, work piece or material and the environmental conditions

iii) interview the injured, eye-witnesses and other involved parties

iv) consult expert opinion where necessary

v) Identify the specific contractor or sub-contractor involved.

2.14.4.5 Having gathered information, it is then necessary to make an analysis of incident

i) establish the chain of events leading to the accident or incident

ii) find out at what stage the accident took place

iii) consider all possible causes and the interaction of different factors that led up to the accident, and identify the most probable cause The cause of an accident should never be classified as carelessness. The specific act or omission that caused the accident must be identified.

2.14.4.6 The next stage is to proceed with the follow-up action

i) report on the findings and conclusions

ii) formulate preventive measures to avoid recurrence

iii) publicize the findings and the remedial actions taken

2.14.5 Employers' Independent Incident Investigation

2.14.5.1 In case of fatal / dangerous occurrence, the Employer may also conduct independent investigation. Contractor and his staff shall extend necessary co-operation and testify about the accident.

2.14.5.2 The Contractor shall take every effort to preserve the scene of accident till the Employer completes the investigation.

2.14.5.3 All persons summoned by the Employer in connection to witness recording shall obey the instructions without delay. Any willful suppression of information by any person shall be removed from the site immediately.

2.15 EMERGENCY RESPONSE PLAN

2.15.1 The Contractor shall prepare an Emergency Response Plan for all work sites as a part of the Contractor's Project and Site Specific SHE Plans. The plan shall integrate the emergency response plans of the Contractor and all other subcontractors. The Emergency Response Plan shall detail the Contractor's procedures, including detailed communications arrangements, for dealing with all emergencies that could affect the Site. This include where applicable, injury, sickness, evacuation, fire, chemical spillage, severe weather and rescue.

2.15.2 The Contractor shall ensure that an Emergency Response Plan is prepared to deal with emergencies arising out of:

i) Fire and explosion

ii) Collapse of lifting appliances and transport equipment

iii) Collapse of building, sheds or structure etc.

iv) Gas leakage or spillage of dangerous goods or chemicals

v) Bomb threatening, Criminal or Terrorist attack

vi) Falling from height / Drowning of workers

vii) Landslides getting workers buried, floods, Earthquake, storms and other natural calamities.

2.15.3 Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the Contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

2.15.4 Contractors shall require to tie-up with the hospitals and fire stations located in the neighborhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.

2.15.5 Contractor shall conduct an onsite emergency mock drill once in every month for all his workers and his subcontractor's workers.

2.15.6 It shall be the responsibility of the Contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to the Engineer and the Employer, telephonically initially and followed by a written report, shall be made by the Contractor.

2.16 EXPERTS / AGENCIES FOR SHE SERVICES

2.16.1 Contractors may utilize the services of experts/agencies empanelled under Rule 250 of BOCWR and Rule 297 of BOCWR for the purpose of training, internal audit and any other SHE services with prior approval of the Engineer / Employer.

2.16.2 As an aide to the Contractor, a list of experts/agencies and the offered service are suggested in General Instruction DFCCIL/SHE/GI/010 in Attachment 7 [Reference for SHE Activities] to Appendix 2 for reference. In addition to it if the Contractor would like to use any expert/agencies' services for any SHE activities the same can also be allowed provided that they are competent and meet to the general requirements of Employer. In every case prior consent of the Engineer / Employer is mandatory.

3. Labour Protection

3.1 GENERAL

The Contractor shall comply in full with the project Workplace Policy on Labour Protection as described in Attachment 6 [Workplace Policy on Labour Protection] to Appendix 2 as well as the specific requirements of the Clauses hereunder.

3.2 ENGAGEMENT OF STAFF AND LABOUR

3.2.1 The Contractor shall engage appropriate staff and labour, local or otherwise to enable him to fulfill all his obligations under the contract in full. The Contractor shall be solely responsible for all matters relating to the engagement and welfare of all persons employed by him in relation to this project.

3.2.2 The Contractor shall give priority to the employment of local people in the construction workforce, especially those affected by land acquisition or resettlement and from disadvantaged households (those headed by women or disabled persons, and/or those living below the official poverty level).

3.2.3 The Contractor shall obtain complete bio-data, and maintain personal details of all employees, including but not limited to the name, age, gender, father's/husband's name, permanent home address, local address, phone number if any, designation, name and location of the work, and shall submit the same to the Engineer before commencement of the work.

3.2.4 The Contractor shall ensure that the employees deployed by him in the premises of the Employer are physically and mentally fit and do not have any criminal record.

3.2.5 The Contractor will provide to each employee and identity card with photograph duly attested by him. The identity card should show the person's name, ID number and work location.

3.3 RATES OF WAGES

3.3.1 The Contractor shall pay rates of wages that are in line with current industry standards and local conditions.

3.3.2 The Contractor shall ensure payment of at least the minimum wages as prescribed and applicable from time to time under the Minimum Wages Act, 1948, in the presence of an authorized representative of the Engineer / Employer; and shall maintain proper records of their timely disbursement. These records shall be preserved for a period of at least 3 years and made available even after the contract is over for any verification by the statutory authorities.

3.3.3 The Contractor shall inform his employees about the tax implications on their salary, wages, allowances, benefits and perquisites, under the laws of the country. The Contractor shall perform such duties as may be imposed on him by such laws, ensure deductions required by law and deposit all such deductions with the statutory authorities in the prescribed manner and within the stipulated period.

3.4 CONDITIONS OF LABOUR

3.4.1 The Contractor shall observe conditions of labour that are no less favourable than those established for the relevant trade or industry, and which at least comply with model standing orders provided under the Industrial Employment (Standing Orders) Act, 1946.

3.4.2 During the course of the work, the Contractor shall afford all employees all basic rights enumerated in the conventions of the International Labour Organization, including freedom of association, right to freedom from forced labour, and right to freedom from discrimination on the basis of race, colour, sex, religion, political opinion and social origin.

3.5 PERSONS IN THE SERVICE OF THE EMPLOYER

The Contractor shall not recruit or attempt to recruit staff or labour from amongst the personnel of the Employer or the Engineer.

3.6 SOCIAL SECURITY

3.6.1 The Contractor shall extend all relevant social security benefits to his employees including but not necessarily limited to those specified in the following statutes:

i) Employees Provident Fund and Miscellaneous Provisions Act, 1952;

ii) Payment of Gratuity Act, 1972;

iii) Employees State Insurance Act, 1948;

iv) Payment Of Bonus Act, 1965;

v) Maternity Benefit Act, 1951.

3.6.2 The Contractor shall provide proof of coverage of his employees under the Employees Provident Fund and Miscellaneous Provisions Act 1952 and the Employees State Insurance Act 1948, via independent code numbers allotted to him by the Central Provident Fund Organization and Employees State Insurance Corporation respectively, prior to his participation in the bidding process.

3.6.3 The Contractor shall provide a Provident Fund pass book to each employee and ensure payment to the Regional Provident Fund Commissioner of Provident Fund, Employees' Deposit-linked Insurance (EDLI), and pension dues as required by the Employees Provident Fund and Miscellaneous Provisions Act 1952.

3.6.4 The Contractor shall ensure payment of appropriate contributions under the Employees State Insurance Act 1948.

3.6.5 The Contractor shall provide proof of deductions as well as remittances of Provident Fund, Employees' Deposit-linked Insurance (EDLI), Pension, Employees State Insurance (ESI) contribution, administrative charges etc, wherever applicable by law and shall maintain proper records.

3.6.6 The Contractor shall furnish proper returns to the concerned statutory authorities.

3.6.7 The Contractor is solely responsible for any non-payment/delayed payment of wages or contributions under the Employees Provident Fund and Miscellaneous Provisions Act, Employees State Insurance Act etc.

3.6.8 The Contractor shall comply with all other relevant conditions of the applicable legislation.

3.6.9 If the Contractor fails to make payment of wages to his employees or remittance of contribution to the concerned authorities, the security deposit and/or other dues under the Contract can be utilized by the Employer to discharge the Contractor's liability.

3.6.10 The Contractor shall insure all his employees under Group Personal Accident Insurance scheme through a recognized and registered insurance company.

3.7 LABOUR LAWS

3.7.1 The Contractor shall comply with all relevant labour laws applicable to his personnel including but not necessarily limited to laws relating to employment, wages, health, safety, welfare, immigration and emigration and shall allow employees all their legal rights.

3.7.2 The Contractor shall ensure that all his employees and sub-contractors obey applicable laws and regulations, including those concerning safety at work.

3.7.3 The Contractor shall comply with all statutory requirements including but not necessarily limited to those contained in the following:

i) Minimum Wages Act, 1948;

ii) Payment of Wages Act, 1936;

iii) Equal Remuneration Act, 1976;

iv) Employees Provident Fund and Miscellaneous Provisions Act, 1952;

v) Payment of Gratuity Act, 1972;

vi) Employees State Insurance Act, 1948;

vii) Payment Of Bonus Act, 1965;

viii) Maternity Benefit Act, 1951;

ix) Industrial Disputes Act, 1947;

x) Industrial Employment (Standing Orders) Act, 1946;

xi) Trade Unions Act, 1926;

xii) Child Labour (Prohibition and Regulation) Act, 1986;

xiii) Building and other Construction Workers (Regulation of Employment of Service) Act 1996;

xiv) Building and other Construction Workers Cess Act of 1996;

xv) The Contract Labour (Regulation and Abolition) Act, 1970;

xvi) Inter State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act ,1979;

xvii) Workmen Compensation Act. 1923;

xviii) Factories Act, 1948;

xix) Mines Act, 1952.

3.7.4 The Contractor shall comply with all other statutory requirements, rules, regulations and notifications in relation to employment of his staff and workers that may be issued from time to time by the concerned government authorities.

3.8 WORKING HOURS

3.8.1 No work shall be carried out on any construction site on National Holidays of the country or on locally recognized days of rest.

3.8.2 No work shall be carried out beyond the statutory limit given under the Building and other Construction Workers (Regulation of Employment of Service) Act of 1996;

3.8.3 No work shall be carried out outside the normal working hours stated in contract unless:

i) otherwise stated in the contract;

ii) The Engineer gives his consent in writing;

iii) The work is unavoidable or necessary for the protection of life or property or for the safety of the works, in which case the Contractor shall immediately inform the Engineer.

3.8.4 Notwithstanding the above, no work shall be carried out in contravention of applicable laws barring any exceptions and exemptions provided under the particular law.

4 Safety

4.1 HOUSEKEEPING

4.1.1 Housekeeping is the act of keeping the working environment cleared of all unnecessary waste, thereby providing a first-line of defense against accidents and injuries.

4.1.2 Contractor shall understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of housekeeping is always maintained. Indeed "Cleanliness is next to Godliness"

4.1.3 Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.

4.1.4 General Housekeeping shall be carried out by the Contractor and ensured at all times at Work Site, Construction Depot, Batching Plant, Labour Camp, Stores, Offices and toilets/urinals. Towards this the Contractor shall constitute a special group of housekeeping personnel as per General Instruction DFCCIL/SHE/GI/001 in Attachment 7 [Reference for SHE Activities] to Appendix 2. This group shall ensure daily cleaning at work sites and surrounding areas and maintain a register as per format consented by the Engineer.

4.1.5 Adequate time shall be assigned to ensure that good housekeeping is maintained. This shall be carried out by the team of housekeeping squad.

4.1.6 The Contractor shall be responsible to provide segregated containers for disposal of debris at required places and regular cleaning of the same.

4.1.7 In areas used by public, full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public. The barricade especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the Engineer. These shall be maintained in one line and level.

4.1.8 The structure dimension of the barricade, material and composition, its colour scheme, DFCCIL logo and other details shall be developed by the Contractor in reference to documents and drawings provided in the Contract Package.

4.1.9 All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, fire fighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.

4.1.10 Lumber with protruding nails shall be either bent or removed and properly stacked. Un-packed wooden strips shall be safely stored and disposed.

4.1.11 All surplus earth and debris are removed/disposed off from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact shall be covered while moving. The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.

4.1.12 No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.

4.1.13 Roads shall be kept clear and materials like: pipes, steel, sand boulders, concrete, chips and brick etc., shall not be allowed on the roads which obstruct free movement of road traffic.

4.1.14 Water logging or bentonite spillage on roads shall not be allowed. If bentonite spillage is observed on road endangering the safety of road users, the Contractor shall immediately carry out the corrective measures on his own costs. Proper and safe stacking of material are of paramount importance at yards, stores and such locations where material would be unloaded for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner.

4.1.15 Flammable chemicals / compressed gas cylinders shall be safely stored.

4.1.16 Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to identified locations(s).

4.1.17 All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

4.1.18 Empty cement bags and other packaging material shall be properly stacked and removed.

4.1.19 The Contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provisions related to house keeping

4.2 WORK AT HEIGHT

4.2.1 Definitions

4.2.1.1 "access" and "egress" include ascent and descent.

4.2.1.2 "fragile surface" means a surface, which would be able to fail if any reasonably foreseeable loading were to be applied to it.

4.2.1.3 "line" includes rope, chain or webbing

4.2.1.4 "personal fall protection" means -

i) a fall prevention, work restraint, work positioning, fall arrest or rescue system, other than a system in which the only safeguards are collective safeguards; or

ii) rope access and positioning techniques;

4.2.1.5 "work at height" means -

i) work in any place, including a place at or below ground level;

ii) obtaining access to or egress from such place while at work, except by a staircase in a permanent workplace,

where, if protective measures were not taken, a person could fall a distance liable to cause personal injury;

4.2.1.6 "work equipment" means any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not) and includes

i) a guard-rail, toe-board, barrier or similar collective means of protection

ii) a working platform

iii) a net, airbag or other collective safe guard for arresting falls.

iv) personal fall protection system

v) ladders

4.2.1.7 "working platform"

i) means any platform used as a place of work or as a means of access to or egress from a place of work;

ii) includes any scaffold, suspended scaffold, cradle, mobile platforms, trestle, gangway, gantry and stairway which is so used.

4.2.2 Organization and Planning

4.2.2.1 The Contractor shall ensure that work at height is

i) properly planned for any emergencies and rescue

ii) appropriately supervised; and

iii) carried out in a manner, which is reasonably practicable safe.

4.2.2.2 The Contractor shall ensure that work at height is carried out only when the weather conditions do not jeopardize the health or safety of persons involved in the work.

4.2.3 Competence

4.2.3.1 The Contractor shall ensure that no person engages in any activity, including organization, planning and supervision, in relation to work at height or work equipment for use in such work unless he is competent to do so or, if being trained, is being supervised by a competent person.

4.2.4 Accident Prevention Measures

The Contractor shall formulate accident preventive measures taking into account of envisaged conditions, situations, and particular activities of the Works which may induce accidents. Then the Contractor shall plan and programme the measures to be implemented in all Work Areas in various construction stages. The Contractor is responsible for incorporating the accident prevention measures against the Work at Height into the SHE activities and efficiently carries out the measures in a practical manner.

4.2.5 Inspection of Work Equipment

4.2.5.1 The Contractor shall ensure that, where the safety of work equipment depends on how it is installed or assembled, it is not used after installation or assembly in any position unless it has been inspected in that position.

4.2.5.2 The Contractor shall ensure that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected

i) at suitable intervals; and

ii) each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred,

to ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time.

4.2.5.3 Without prejudice to paragraph 4.2.9.1, the Contractor shall ensure that a working platform

i) used for construction work; and

ii) from which a person could fall 2 metres or more,

is not used in any position unless it has been inspected in that position or, in the case of a mobile working platform, inspected on the site, within the previous 7 days.

4.2.5.4 The Contractor shall ensure that the reports of all inspections are properly maintained and shown to the Engineer as and when required.

4.2.5.5 In this clause "inspection",

i) means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes;

ii) includes any testing appropriate for those purposes,

4.2.6 Inspection of Places of Work at Height

4.2.6.1 The Contractor shall so far as is reasonably practicable ensure that the surface and every parapet, permanent rail or other such fall protection measure of every place of work at height are checked on each occasion before the place is used.

4.2.7 Duties of Persons at Work

4.2.7.1 Any workmen employed by the Contractor shall report to the supervisor about any defect relating to work at height which he knows is likely to endanger the safety of himself or another person.

4.2.7.2 Every workmen shall use any work equipment or safety device provided to him for work at height by the Contractor, in accordance with

i) any training in the use of the work equipment or device concerned which have been received by him; and

ii) the instructions respecting that use which have been provided to him by the Contractor as per the requirements of the Employer

4.2.8 Requirements for Existing Places of Work and Means of Access or Egress at Height

4.2.8.1 Every existing place of work or means of access or egress at height shall

i) be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used;

ii) where applicable, rest on a stable, sufficiently strong surface;

iii) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work to be carried out there;

iv) possess suitable and sufficient means for preventing a fall;

v) possess a surface which has no gap

a) through which a person could fall;

b) through which any material or object could fall and injure a person; or

c) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk;

vi) be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable -

a) the risk of slipping or tripping; or

b) any person being caught between it and any adjacent structure;

vii) where, it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

4.2.9 Requirements for Guardrails, Toe-boards, Barriers and Similar Collective Means of Protection

4.2.9.1 Unless the context otherwise requires, any reference in this section to means of protection is to a guardrail, toe-board, barrier or similar collective means of protection.

4.2.9.2 Means of protection shall

i) be of sufficient dimensions, of sufficient strength and rigidity for the purposes for which they are being used, and otherwise suitable;

ii) be so placed, secured and used as to ensure, so far as is reasonably practicable, that they do not become accidentally displaced; and

iii) be so placed as to prevent, so far as is practicable, the fall of any person, or of any material or object, from any place of work.

4.2.9.3 In relation to work at height involved in construction work

i) the top guard-rail or other similar means of protection shall be at least 950 millimeters above the edge from which any person is liable to fall;

ii) toe-boards shall be suitable and sufficient to prevent the fall of any person, or any material or object, from any place of work; and

iii) any intermediate guardrail or similar means of protection shall be positioned so that any gap between it and other means of protection does not exceed 470 millimetres.

4.2.9.4 Any structure or part of a structure which supports means of protection or to which means of protection are attached shall be of sufficient strength and suitable for the purpose of such support or attachment.

4.2.10 Requirements for All Working Platforms

4.2.10.1 Every working platforms requires a supporting structure for holding it

4.2.10.2 Any surface upon which any supporting structure rests shall be stable, of sufficient strength and of suitable composition safely to support the supporting structure, the working platform and any loading intended to be placed on the working platform.

4.2.10.3 Stability of supporting structure: any supporting structure shall:

i) be suitable and of sufficient strength and rigidity for the purpose for which it is being used;

ii) in the case of a wheeled structure, be prevented by appropriate devices from moving inadvertently during work at height;

iii) in other cases, be prevented from slipping by secure attachment to the bearing surface or to another structure, provision of an effective anti-slip device or by other means of equivalent effectiveness;

iv) be stable while being erected, used and dismantled; and

v) when altered or modified, be so altered or modified as to ensure that it remains stable.

vi) Have suitable base plates and properly footed thereby.

4.2.10.4 Stability of working platforms: a working platform shall

i) be suitable and of sufficient strength and rigidity for the purpose or purposes for which it is intended to be used or is being used;

ii) be so erected and used as to ensure that its components do not become accidentally displaced so as to endanger any person;

iii) when altered or modified, be so altered or modified as to ensure that it remains stable; and

iv) be dismantled in such a way as to prevent accidental displacement.

4.2.10.5 Safety on working platforms: a working platform shall:

i) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work being carried out there;

ii) possess a suitable surface and, in particular, be so constructed that the surface of the working platform has no gap

a) through which a person could fall;

b) through which any material or object could fall and injure a person; or

c) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk; and

iii) be so erected and used, and maintained in such condition, as to prevent, so far as is reasonably practicable

a) the risk of slipping or tripping; or

b) any person being caught between the working platform and any adjacent structure.

4.2.10.6 Loading: a working platform and any supporting structure shall not be loaded so as to give rise to a risk of collapse or to any deformation, which could affect its safe use.

4.2.10.7 Additional requirements for scaffolding: strength and stability calculations for scaffolding shall be carried out unless

i) a note of the calculations, covering the structural arrangements contemplated, is available; or

ii) it is assembled in conformity with a generally recognised standard configuration.

4.2.10.8 Depending on the complexity of the scaffolding selected, a competent person shall draw up an assembly, use and dismantling plan. This may be in the form of a standard plan, supplemented by items relating to specific details of the scaffolding in question.

4.2.10.9 A copy of the plan, including any instructions it may contain, shall be kept available for the use of persons concerned in the assembly, use, dismantling or alteration of scaffolding until it has been dismantled.

4.2.10.10 The dimensions, form and layout of scaffolding decks shall be appropriate to the nature of the work to be performed and suitable for the loads to be carried and permit work and passage in safety.

4.2.10.11 While a scaffold is not available for use, including during its assembly, dismantling or alteration, it shall be marked with general warning signs in accordance with and be suitably delineated by physical means preventing access to the danger zone.

4.2.10.12 Scaffolding may be assembled, dismantled or significantly altered only under the supervision of a competent person and by persons who have received appropriate and specific training in the operations envisaged which addresses specific risks which the operations may entail and precautions to be taken, and more particularly in

i) understanding of the plan for the assembly, dismantling or alteration of the scaffolding concerned;

ii) safety during the assembly, dismantling or alteration of the scaffolding concerned;

iii) measures to prevent the risk of persons, materials or objects falling;

iv) safety measures in the event of changing weather conditions which could adversely affect the safety of the scaffolding concerned;

v) permissible loadings;

vi) any other risks which the assembly, dismantling or alteration of the scaffolding may entail.

4.2.11 Requirements for Collective Safeguards for Arresting Falls

4.2.11.1 Collective safeguard are a safety net, airbag or other collective safeguard for arresting falls

4.2.11.2 A safeguard shall be used only if

i) a risk assessment has demonstrated that the work activity can so far as is reasonably practicable be performed safely while using it and without affecting its effectiveness;

ii) the use of other, safer work equipment is not reasonably practicable; and

iii) a sufficient number of available persons have received adequate training specific to the safeguard, including rescue procedures.

4.2.11.3 A safeguard shall be suitable and of sufficient strength to arrest safely the fall of any person who is liable to fall.

4.2.11.4 A safeguard shall:

i) in the case of a safeguard which is designed to be attached, be securely attached to all the required anchors, and the anchors and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of safely supporting the foreseeable loading in arresting any fall and during any subsequent rescue;

ii) in the case of an airbag, landing mat or similar safeguard, be stable; and

iii) in the case of a safeguard, which distorts in arresting a fall, afford sufficient clearance.

4.2.11.5 Suitable and sufficient steps shall be taken to ensure, so far as practicable, that in the event of a fall by any person the safeguard does not itself cause injury to that person.

4.2.12 Requirements for Personal Fall Protection Systems

4.2.12.1 A personal fall protection system shall be used only if:

i) a risk assessment has demonstrated that

a) the work can so far as is reasonably practicable be performed safely while using that system; and

b) the use of other safer work equipment is not reasonably practicable; and

ii) the user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.

4.2.12.2 A personal fall protection system shall

i) be suitable and of sufficient strength for the purposes for which it is being used having regard to the work being carried out and any foreseeable loading;

ii) where necessary, fit the user;

iii) be correctly fitted;

iv) be designed to minimize injury to the user and, where necessary, be adjusted to prevent the user falling or slipping from it, should a fall occur; and

v) be so designed, installed and used as to prevent unplanned or uncontrolled movement of the user.

4.2.12.3 A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of supporting any foreseeable loading.

4.2.12.4 Suitable and sufficient steps shall be taken to prevent any person falling or slipping from a personal fall protection system.

4.2.13 Requirements for Ladders

4.2.13.1 Every contractor shall ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk and

i) The short duration of use; or

ii) Existing features on site, which he cannot alter.

4.2.13.2 Only metal ladders shall be allowed. Bamboo ladders are prohibited.

4.2.13.3 Any surface upon which a ladder rests shall be stable, firm, of sufficient strength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.

4.2.13.4 A ladder shall be so positioned as to ensure its stability during use

4.2.13.5 A suspended ladder shall be attached in a secure manner and so that, with the exception of a flexible ladder, it cannot be displaced and swinging is prevented.

4.2.13.6 A portable ladder shall be prevented from slipping during use by -

i) securing the stiles at or near their upper or lower ends;

ii) an effective anti-slip or other effective stability device; or

iii) any other arrangement of equivalent effectiveness.

4.2.13.7 A ladder used for access shall be long enough to protrude sufficiently above the place of landing to which it provides access, unless other measures have been taken to ensure a firm handhold.

4.2.13.8 No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.

4.2.13.9 A mobile ladder shall be prevented from moving before it is stepped on.

4.2.13.10 Where a ladder or run of ladders raises a vertical distance of 9 metres or more above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.

4.2.13.11 Every ladder shall be used in such a way that

i) a secure handhold and secure support are always available to the user; and

ii) the user can maintain a safe handhold when carrying a load unless, in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of

a) the low risk; and

b) the short duration of use.

4.3 OVERHEAD PROTECTION

4.3.1 All contractors shall provide overhead protections as per Rule 41 of BOCWR

4.3.2 Overhead protection should be erected along the periphery of every building which is under construction and the building height shall be 15m or above after construction.

4.3.3 Overhead protection shall be minimum 2m wide and the outer edge shall be 150mm higher than the inner edge and an angle not more than 20 degrees to its horizontal sloping into the building.

4.3.4 Overhead protection shall not be erected more than a height of 5m from the base of the building.

4.3.5 Areas of inadvertent hazard of falling of material shall be guarded or barricaded or roped-off thereby by the Contractor.

4.4 SLIPPING, TRIPPING, CUTTING, DROWNING AND FALLING HAZARDS

4.4.1 As per Rule 42 of BOCWR,

i) All places should be free from dust, debris or similar materials.

ii) Sharp projections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.

iii) Contractor shall not allow workmen to work or use platforms, scaffolds/passageways or any walkways, which has water, or oil or similar substances spilt and has a slipping hazard, unless it is cleaned off or covered or sanded or saw dusted or make it safe with any suitable material.

iv) When workers are exposed to areas where fall into water is possible, the Contractor shall provide suitable and adequate equipment for saving the workers from drowning and rescuing from such hazard. If the Engineer considers, the Contractor shall provide well-equipped boat or launch, manned with trained personnel at the work place.

v) Open side or opening where worker, equipment, vehicle or lifting appliance may fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.

vi) Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.

4.5 LIFTING APPLIANCES AND GEAR

4.5.1 General

4.5.1.1 Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, loffing machinery sheaves, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyenuts and other accessories of a lifting appliance.

4.5.1.2 No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:

i) the weights, dimensions and lift radii of the heaviest and largest loads

ii) the maximum lift height, the maximum lift radius and the weight of the loads that shall be handled at each

iii) the number and frequency of lifts to be made

iv) how long the crane will be required on site

v) the type of lifting to be done (for example, is precision placement of loads important?

vi) the type of carrier required (this depends on ground conditions and machine capacity In its operating quadrants: capacity is normally greatest over the rear, less over the side, and non-existent over the front

vii) whether loads will have to be walked or carried

viii) whether loads will have to be suspended for lengthy periods

ix) the site conditions, including the ground where the machine will be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation

4.5.1.3 The Contractor shall ensure that a valid certificate of fitness issued as per Chapter 10.1.4 is available for all lifting appliances including synchronized mobile jacks, pre-stressing hydraulic jacks, jacks fitted with launching girders etc. and the Engineer's consent before inducting to the site. Only after obtaining the Engineer's consent, any lifting appliances and gear shall be used.

4.5.1.4 The laminated photocopies of fitness certificate issued by competent person, the Engineer's approval letter, the operators' photo, manufacturer's load chart and competency certificate shall always be either kept in the operator cabin or pasted on the visible surface of the lifting appliances.

4.5.1.5 All lifting appliances and loose gears shall be clearly marked for its safe working load and identification by stamping or other suitable means.

4.5.1.6 The Contractor shall also maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.

4.5.1.7 At least one trained banksman shall be in attendance at each lifting or hoisting installation.

4.5.1.8 All lifting hooks shall have a safety latch.

4.5.2 Test and Periodical Examination of Lifting Appliances and Gears

4.5.2.1 All lifting appliances including all parts and gears thereof, whether fixed or movable shall be thoroughly tested and examined by a competent person once at least in every six months or after it has undergone any alterations or repairs liable to affect its strength or stability. Within the validity, if the lifting appliances are shifted to a new site, re-examination by the same competent person for ensuring its safety shall also be done.

4.5.2.2 Contractors can utilize the services of any competent person as defined in BOCW Act, 1996 or Factories Act, 1948, or Dock Safety Act, 1987 and approved by corresponding act approving authority or any other equivalent agency with the permission of the Engineer.

4.5.2.3 All alarms and signals like automatic safe load indicators (SLI), boom angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition

4.5.3 Automatic Safe Load Indicators

4.5.3.1 As stipulated in Rule 57 of BOCW Rules, every lifting appliances and gears like cranes, hydras etc., if so constructed that the safe working load may be varied by raising or lowering of the jib or otherwise shall be attached with an automatic indicator of safe working loads approved by Bureau of Indian standards/ International certifying bodies which gives a warning to the operator and arrests further movements of the lifting parts.

4.5.4 Qualification of Operator of Lifting Appliances and of Signaller etc.

4.5.4.1 The Contractor shall not employ any person to drive or operate a lifting machine like crane, hydra etc whether driven by mechanical power or otherwise or to give signals to work as a operator of a rigger or derricks unless he

i) is above twenty-one years of age and possesses a valid heavy transport vehicle driving license as per Motor Vehicle Act and Rules.

ii) is absolutely competent and reliable

iii) possesses the knowledge of the inherent risks involved in the operation of lifting appliances by undergoing a formal training at any institution of national importance acceptable to the Engineer.

iv) is medically examined periodically as specified in schedule VII of BOCW Rules.

4.5.5 General Requirements of Appliances

4.5.5.1 Out-of level: one of the most severe effects of being out-of fit level is that side loads develop in the boom. Because of side loads all mobile cranes lose capacity rapidly as the degree of out-of-level increases and therefore

4.5.5.2 Boom

i) The boom is one of the more critical elements of the crane and shall be in perfect condition at all time. No boom section with a bent lattice member shall be allowed

ii) All welds shall be crack and corrosion free

iii) No member of the boom shall be bent

iv) All telescopic boom shall be free from cracks, rust, flaking or cracked paint, bulges, greases or varnishes

4.5.5.3 The sweep area (work area) of the construction machinery shall be always free from obstructions.

4.5.5.4 All hydraulic piping and fittings shall be maintained leak proof.

4.5.5.5 The operator cab shall posses good and safe:

i) structure, windows and windshield wipers

ii) Drivers chair and foot rest

iii) Control handles

iv) Cab instrumentation

v) Telecommunication

vi) Cab out fitting

vii) wind indicator with an adjustable set point shall be in a position representative for the wind on the crane. The indicator shall give continuous information regarding constant speeds and gusts.

4.5.6 Mandatory Rigging Requirements

4.5.6.1 Rigging shall be done under experienced and qualified rigger only.

4.5.6.2 The primary requirement in rigging shall be to assess the weight of load before attempting any lift.

4.5.6.3 All hooks shall be fitted with Master Rings having certificate of fitness from the competent person, so that the hooks are subjected to balanced vertical loading only.

4.5.6.4 Only four legged slings shall be allowed which includes master link (ring), intermediate master link (ring) if necessary, chain / wire rope sling, sling hook or other terminal fitting.

4.5.6.5 Hand spliced slings up to 32mm diameter shall not be used at site for any lifting purpose.

4.5.6.6 No load shall be slewed over public areas without stopping the pedestrians and road traffic first.

4.5.6.7 Requirements of outriggers

i) All outriggers shall be fully extended and at all tyres are clear of the ground

ii) Heavy duty blocking having large bearing area shall be necessary to prevent sinking of floats

4.5.6.8 All loads shall have tag-lines attached in order to ensure that the load can be controlled at all times.

4.5.6.9 No close working to any live overhead power line is permitted without the operation of a strict Permit to Work.

4.5.6.10 Minimum lighting is to be ensured at all lifting operations.

4.6 LAUNCHING OPERATION

4.6.1 As launching operation is one of the riskiest job, the Contractor shall take utmost precaution at all stages like; planning, establishing casing yard, casting segments, transporting segments, fabrication and erection of launching girders, if any, launching of segments / lifting of segments, pre-stressing, auto launching of girders and dismantling of launching girders.

4.6.2 The Contractor shall prepare a comprehensive Method Statement for the launching operation, adhering to the SHE conditions laid down herein. Particular reference shall be made to the provisions on working at height. As the entire process of launching/lifting has to be undertaken at the Site especially during night time, the safety of workers are of paramount important. The following general guidelines shall be adhered throughout the launching operation.

i) Necessary 'working platforms' and fall protection anchorage arrangement shall be provided in the launching girder itself.

ii) Provisions for mounting light fittings shall also be made available in the launching girder.

iii) The casting yard shall be established ensuring the provision given in clause 4.22.

iv) The workmen engaged in fabrication of reinforcement, concreting the segment shall be provided with necessary PPEs including compulsory hand protection gloves.

v) Casting and curing of segment shall be undertaken under the direct supervision of the responsible Engineer of the Contractor.

vi) Trucks with valid registration, license, safe worthiness certificate, Engineer's approval certificate, and pollution under check certificate shall only be used for transport of segments.

vii) Drivers engaged for driving these trucks, shall be trained once in 6 months at Automobile Association of Western India or other organization identified by the Engineer on defensive driving.

viii) Drivers shall also have undergone proper medical examination as per relevant clause mentioned under 'Medical Facilities'.

ix) The segments shall be rigidly secured to the truck with necessary wooden wedges and necessary red indicators/safety tapes provided so that the vehicle is clearly seen by other road users both in day / night time.

x) Every launching girder/lifting process shall have a responsible Engineer on duty all the time.

xi) All the time from erection to dismantling, the area between the two piers wherein launching is in progress shall always be barricaded.

xii) Unloading of segments from trucks, lifting of segments, shifting of segments, gluing shall be done under the direct supervision of the approved Engineer of the Contractor.

xiii) Auto launching shall be done only after consent of the Engineer to the scheme. After every auto launching the stability of launching girder shall be ensured.

xiv) The vertical deflection of launching girder shall be monitored at all critical stages like with/without loads and after every auto launching.

xv) A register containing all important operational details from erection to dismantling of launching girders shall be maintained and made available to Engineer whenever called for.

xvi) Test certificate for all lifting gears including Macalloy bars, if any, shall be maintained at a location closer to the launching girder itself so that it can be referred during all inspections.

xvii) Adequate lighting at all time shall be ensured in the entire area of operation.

xviii) Access to drinking water & toilet shall be ensured to all workmen engaged for launching process.

xix) Proper access ladders/stairways shall be maintained for safe ascending / descending of workmen / Engineers.

4.7 CONSTRUCTION MACHINERY

4.7.1 General

4.7.1.1 Construction machineries may include dumpers and dump trucks, lift trucks and telescopic handlers, transit mixers, batching & mixing plants, crushers, concrete pumps, piling rigs, vibro hammers, rail welding equipments, mobile elevating work platforms, cranes, tipper lorries, lorry loaders, skip wagons, 360° excavators, 180° backhoe loaders, crawler tractors, scrapers, graders, loading shovels, trenchers, side booms, pavers, planers, chippers, road rollers, locomotives, tankers and browsers, trailers, hydraulic and mechanical breakers etc.

4.7.2 Safe Worthiness Certificate

4.7.2.1 Each construction equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or carry manufacturers' warranty in case of brand new equipments or authorized persons / firms approved by Engineer before induction to any site.

4.7.2.2 Every such certificate shall have the date of purchase, main overhauling undertaken in the past, any accident to the equipment, visual examination details, critical components safety check, list of safety devises and its working condition, manufacturer's maintenance checklist, past projects wherein the equipments were used etc. as its minimum content.

4.7.3 Reverse Horns

4.7.3.1 All Vehicles shall be fitted with audible reverse alarms and maintained in good working condition. Reversing shall be done only when there is adequate rear view visibility or under the directions of a banksman.

4.7.4 General Operating Procedures

4.7.4.1 Drivers entering site shall be instructed to follow the safe system of work adopted on site. These shall be verbal instructions or, preferably, written instructions showing the relevant site rules, the site layout, delivery areas, speed limits, etc.

4.7.4.2 No passengers shall be carried, unless specific seating has been provided in accordance with the manufacturers recommendations.

4.7.4.3 Working on gradients beyond any equipments capability shall not be allowed.

4.7.4.4 Prevention of dumper and dump truck accidents should be managed by providing for adequate lateral clearances, wheel stops at a sufficient distance from the edges of excavations, spoil heaps, pits, markers, etc.

4.7.4.5 The manufacturer's recommended bucket size shall not be exceeded in excavators.

4.7.4.6 If excavators operating on a gradient which cannot be avoided, it shall be ensured that the working cycle is slowed down, that the bucket is not extended too far in the downhill direction, and that travel is undertaken with extreme caution. A large excavator shall never be permitted to travel in a confined area, or around people, without a banksman to guide the

driver, who should have the excavator attachment close in to the machine, with the bucket just clear of the ground. On wheeled excavators, it is essential that the tyres are in good condition and correctly inflated. If stabilizing devices are fitted, they should be employed when the machine is excavating.

4.7.4.7 When the front shovel of the 1800 backhoe loaders is being employed, the backhoe attachment shall be in its "travel" position, with the safety locking device in place.

4.7.4.8 When operating the backhoe in poor ground conditions, the stabilizers tend to sink into the surface of the ground, reducing stability. Therefore frequent checks shall be made for the stability of the machine. The loading shovel should always be lowered to the ground to stabilize the machine when the backhoe is employed.

4.7.4.9 The netting operation of the skip wagons should be carried out prior to lifting the skip to reduce the risks of working on the rear platform

4.7.4.10 If a tractor dozer is employed on clearing scrub or felling trees, it shall be provided with adequate driver protection.

4.7.4.11 When two or more scrapers are working on the same job, a minimum distance of at least 25m shall be kept between them.

4.7.4.12 In case of hydraulic breakers, hydraulic rams and hoses shall be in good working condition

4.7.4.13 While excavating care shall be taken against falling boulders, caving-in, etc., to avoid damage to men, equipment and materials. This precaution is all the more important while working close to existing railway tracks/ roads.

4.7.4.14 All wood working machines shall be fitted with suitable guards and devices such as top guard, riving knife, push stick, guards for drive belts and chains, and emergency stop switch easily accessible by the operator.

4.8 MACHINE AND GENERAL AREA GUARDING

4.8.1 The Contractor shall ensure at the construction site all motors, cogwheels, chains and friction gearing, flywheels, shafting, dangerous and moving parts of machinery are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

4.9 MANUAL LIFTING AND CARRYING OF EXCESSIVE WEIGHT

4.9.1 The Contractor shall ensure at his construction site of a building or other construction work that no building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight as said below as per Rule 38 of BOCWR, unless aided by another building worker or device.

Person	Maximum weight in kg.
Adult man	55
Adult woman	30

4.9.2 No building worker aided by other building worker shall lift or carry weight higher than or exceeding the sum of total of maximum limits set out for each building worker separately as mentioned in the table above.

4.10 SITE ELECTRICITY

4.10.1 Competency of Electrical Personnel:

4.10.1.1 The Contractor shall employ qualified and competent electrical personnel as specified in

General Instruction DFCCIL/SHE/GI/001.

4.10.2 Assessment of Power

4.10.2.1 The Contractor shall assess the size and location of the electrical loads and the manner in which they vary with time during the currency of the Contract.

4.10.2.2 The Contractor shall elaborate as to how the total supply is to be obtained / generated. The details of the source of electricity, earthing requirement, substation / panel boards, distribution system shall be prepared and necessary approval from Engineer obtained before proceeding of the execution of the job.

4.10.2.3 The Contractor shall take consideration, the requirements of the sub / petty contractors' electric power supply and arrive at the capacity of main source of power supply.

4.10.2.4 As the sub / petty contractors' small capacity generators create more noise and safety hazard, no small capacity diesel generators shall be allowed for whatsoever the type of job to be executed under this Contract.

4.10.2.5 If any unsafe noise making small capacity diesel generators are found being used by sub / petty contractors, the Contractor shall only be responsible.

4.10.3 Work on Site

4.10.3.1 The Contractor shall also submit electrical single line diagram, schematic diagram and the details of the equipment for all temporary electrical installation and these diagrams together with the temporary electrical equipment shall be submitted to the Engineer for necessary approval.

4.10.4 Strength and Capability of Electrical Equipment

4.10.4.1 No electrical equipment shall be put into use where its strength and capability may be exceeded in such a way as may give rise to danger.

4.10.5 Adverse or Hazardous Environments

4.10.5.1 Electrical equipment which may reasonably foreseeably be exposed to-

i) mechanical damage;

ii) the effects of the weather, natural hazards, temperature or pressure;

iii) the effects of wet, dirty, dusty or corrosive conditions; or

iv) any flammable or explosive substance, including dusts, vapours or gases,

shall be of such construction or as necessary protected as to prevent, so far as is reasonably practicable, danger arising from such exposure.

4.10.6 Distribution System

4.10.6.1 The Contractor shall provide distribution system for control and distribution of electricity from a main AC supply of 50Hz for typical appliances,

i) Fixed plant – 400V 3 phase

ii) Movable plant fed via trailing cable over 3.75 kW – 400V 3 phase

iii) Installation in site buildings – 230V single phase

iv) Fixed flood lighting – 230V single phase

v) Portable and hand tools – 115V single phase

vi) Site lighting - 115V single phase

vii) Portable hand lamps – 115V single phase

4.10.7 Electrical Protection Circuits

4.10.7.1 Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged. A conductor shall be regarded as earthed when conductors of sufficient strength and current-carrying capability to discharge electrical energy to earth connect it to the general mass of earth.

4.10.7.2 If a circuit conductor is connected to earth or to any other reference point, nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.

4.10.7.3 Appropriate electrical protection shall be provided for all circuits, against over load, short circuit and earth fault current.

4.10.7.4 The Contractor shall provide sufficient ELCBs (maintain sensitivity 30 mA) / RCCBs for all the equipments (including Potable equipments), electrical switchboards, distribution panels etc. to prevent electrical shocks to the workers.

4.10.7.5 All protection devices shall be capable of interrupting the circuit without damage to any equipment and circuits in case of any fault may occur.

4.10.7.6 Rating of fuses and circuit breakers used for the protection of circuits should be coordinate with equipment power ratings.

4.10.7.7 Protection against lightning shall be ensured to all equipment kept in open at sites.

4.10.8 Cables

4.10.8.1 Cables shall be selected after full consideration of the condition to which they shall be exposed and the duties for which they are required. Supply cable up to 3.3 kV shall be in accordance with BS 6346.

4.10.8.2 For supplies to mobile or transportable equipment where operating of the equipment subjects the cable to flexing, the cable shall conform to any of these codes BS 6007 / BS 6500 / BS 7375.

4.10.8.3 Flexible cords with a conductor cross sectional area smaller than 1.5 mm^2 shall not be used and insulated flexible cable shall conform to BS 6500 and BS 7375.

4.10.8.4 Where low voltage cables are to be used, reference shall be made to BS 7375. The following standards shall also be referred to particularly for underground cables BS 6346 and BS 6708

4.10.8.5 Cables buried directly in the ground shall be of a type incorporating armour or metal sheath or both. Such cables shall be marked by cable covers or a suitable marking tape and be buried at a sufficient depth to avoid their being damaged by any disturbance of the ground. Cable routes shall be marked on the plans kept in the site electrical register.

4.10.8.6 Cabling passing under the walk way and across way for transport and mobile equipment shall be laid in ducts at a minimum depth of 0.6 meters.

4.10.8.7 Cables that need to cross open areas, or where span of 3m or more are involved, a catenary wire on poles or other supports shall be provided for convenient means of suspension. Minimum height shall be 6 m above ground.

4.10.8.8 Cables carrying a voltage to earth in excess of 65V other than supply for welding process shall have metal armour or sheath, which has been effectively earthed and monitored by the Contractor. In case of flexible and trailing cables such earthed metal sheath and/or armour should be in addition to the earth core in the cable and shall not be used as the protective conductor.

4.10.8.9 Armoured cables having an over-sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage

occurring

4.10.9 Plugs, Socket-outlets and Couplers

4.10.9.1 The Contractor shall ensure plugs, socket-outlets, and couplers available in the construction site as "splash proof" type. The minimum degree of Ingress Protection should be of IP44 in accordance with BS EN 60529.

4.10.9.2 Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the Internationally recognized standards for example as detailed as follows:

i) 110 volts : Yellow.

ii) 240 volts : Blue.

iii) 415 volts : Red.

4.10.10 Connections

4.10.10.1 Every joint and connection in a system shall be mechanically and electrically suitable for use to prevent danger. Proper cable connectors as per national/international standards shall only be used to connect cables.

4.10.10.2 No loose connections or tapped joints shall be allowed anywhere in the work site, office area, stores and other areas.

4.10.11 Portable and Hand-held Equipments

4.10.11.1 The Contractor shall ensure the use of double insulated or all-insulated portable electrical hand equipment may be used without earthing (i.e. two core cables), but they shall still be used only on 110V because of the risk of damage to trailing leads.

4.10.12 Other Equipments

4.10.12.1 All equipment shall have the provision for major switch/cut-off switch in the equipment itself.

4.10.12.2 All non-current carrying metal parts of electrical equipment shall be earthed through insulated cable

4.10.12.3 Isolate exposed high-voltage (over 415 Volts) equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts and prevent unauthorised access.

4.10.12.4 Approved perimeter markings shall be used to isolate restricted areas from designated work areas and entryways and shall be erected before work begins and maintained for entire duration of work. Approved perimeter marking shall be installed with either red barrier tape printed with the words "DANGER—HIGH VOLTAGE" or a barrier of yellow or orange synthetic rope, approximately 1 to 1.5 meter above the floor or work surface.

4.10.13 Work On or Near Live Conductors

4.10.13.1 No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless-

i) it is unreasonable in all the circumstances for it to be dead; and

ii) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and

iii) Suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

4.10.14 Inspection and Maintenance

4.10.14.1 All electrical equipment should be permanently numbered and a record kept of the date of issue, date of last inspection and recommended inspection period.

4.10.14.2 Fixed installations shall be inspected at least at three monthly intervals; routine maintenance being carried out in accordance with equipment manufactures recommendations.

4.11 LIGHTING

4.11.1 General

4.11.1.1 The Contractor shall provide sufficient site lighting, of the right type and at the right place for it to be properly effective. Lighting ought not to introduce the risk of electric shock. Therefore, 230V supplies should be used for those fittings, which are robustly installed, and well out of reach e.g. flood lighting or high-pressure discharge lamps.

4.11.2 Selection of Luminaries:

4.11.2.1 The Contractor shall select the luminaries as per the area requirement indicated below:

Type of Lighting	Area of Requirement	Luminaries
Area Lighting	Workmen and vehicles to move about in safely.	i) Shovel type: non-symmetrical ii) Symmetrical or non- symmetrical tungsten halogen
Beam flood lighting	Concentrated light over an area from a relatively great distance.	i) Portable flood light (Conical beam) ii) Wide angle flood (fan shaped beam) iii) Medium or narrow angle flood (Conical beam)
Dispersive lighting	Lighting for indoor	i) Dispersive (Mercury florescent) ii) Cargo cluster iii) Florescent trough
Walkway lighting	Lighting for stairways, ladder ways, corridors, scaffold access routes, etc.	i) Well glass unit ii) Bulkhead unit (tungsten filament) iii) Bulk head unit (Florescent)
Local lighting	Lighting on sites and fittings are generally accessible to operatives	i) PAR (Parabolic Aluminised Reflector) lamp cluster ii) Festoons (with or without shades) iii) Adjustable florescent work lamp iv) Portable flood lamp (mounted on own cable drum)

4.11.2.2 The Contractor shall ensure that luminaries should always be placed so that no person is required to work in their own shadow and so that the local light for one person is not a source of glare for the others. Strongly made clamps should be available for attaching luminaries to poles and other convenient supports.

4.11.2.3 Luminaries should be robust, resistant to corrosion and rain proof especially at the point of the cable entry.

4.11.2.4 The correct type of lamp for each luminary should always be used and when lamps need to be replaced if shall be in accordance with the supply voltage.

4.11.2.5 Lamp holders not fitted with a lamp should be capped off.

4.11.2.6 The Contractor shall take every effort to illuminate the work site as per the Employer's Requirement illustrated in General Instruction DFCCIL/SHE/GI/0011 in Attachment 7 [Reference for SHE Activities] to Appendix 2.

4.12 HAND TOOLS AND POWER TOOLS

4.12.1 General

4.12.1.1 The Contractor is wholly responsible for the safe condition of tools and equipment used by his employees and that of his sub-contractors.

4.12.1.2 Use of short / damaged hand tools shall be avoided and the Contractor shall ensure all his hand tools used at his worksite are safe to work with or stored and shall also train his employees (including his sub-contractors) for proper use thereby.

4.12.1.3 All hand tools and power tools shall be duly inspected before use for safe operation.

4.12.1.4 All hand tools and power tools shall have sufficient grip and the design specification on par with national/international standards on anthropometrics.

4.12.2 Hand Tools

4.12.2.1 Hand tools shall include but not limited to saws, chisels, axes and hatches, hammers, hand planes, screw drivers, crow bars, nail pullers etc..

4.12.2.2 The Contractor shall ensure that,

i) For crosscutting of hardwood, saws with larger teeth points (no. of points per inch) shall be preferred to avoid the saw jumping out of the job.

ii) Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.

iii) Unless hatchet has a striking face, it shall be used as a hammer.

iv) Only knives of retractable blades shall be used in the worksite.

v) No screwdrivers shall be used for scraping, chiselling or punching holes.

vi) A pilot hole shall always be driven before driving a screw.

vii) Wherever necessary, usage of proper PPEs shall be used by his employees.

4.12.3 Power Tools

4.12.3.1 Power tools include but not limited to drills, planes, routers, saws, jackhammers, grinders, sprayers, chipping hammers, air nozzles and drills etc..

4.12.3.2 The Contractor shall ensure that

i) Electric tools are properly grounded or / and double insulated.

ii) GFCIs/ RCCBs shall be used with all portable electric tool operated especially outdoors or in wet condition.

iii) Before making any adjustments or changing attachments, his workers shall disconnect the tool from the power source.

iv) When operating in confined spaces or for prolonged periods, hearing protection shall be required. The same shall also apply to working with equipments, which gives out more noise as mentioned in clause 5.3 of this contract document.

v) Tool is held firmly and the material is properly secured before turning on the tool.

vi) All drills shall have suitable attachments respective of the operations and powerful for ease of operation.

vii) When any work / operation need to be performed repeatedly or continuously, tools specifically designed for that work shall be used. The same is applicable to detachable tool bit also.

viii) Size of the drill shall be determined by the maximum opening of the chuck in case of drill bit.

ix) Attachments such as speed reducing screwdrivers and buffers shall be provided to prevent fatigue and undue muscle strain to his workers.

x) Stock should be clamped or otherwise secured firmly to prevent it from moving.

xi) Workers shall never stand on the top of the ladder to drill holes in walls / ceilings, which can be hazardous, instead standing on the fourth or fifth rung shall be recommended.

xii) Electric plane shall not be operated with loose clothing or long scarf or open jacket.

xiii) Safety guards used on right angle head or vertical portable grinders shall cover a minimum of 1800 of the wheel and the spindle / wheel specifications shall be checked.

xiv) All power tools / hand tools shall have guards at their nip points.

xv) Low profile safety chain shall be used in case of wood working machines and the saw shall run at high rpm when cutting and also correct chain tension shall be ensured to avoid "kickback".

xvi) Leather aprons and gloves shall be used as an additional personal protection auxiliary to withstand kickback.

xvii) Push sticks shall be provided and properly used to hold the job down on the table while the heels moves the stock forward and thus preventing kickbacks.

xviii) Air pressure is set at a suitable level for air actuated tool or equipment being used. Before changing or adjusting pneumatic tools, air pressure shall be turned off.

xix) Only trained employees shall use explosive actuated tools and the tool shall also be unloaded when not in use.

xx) Usage of such explosive actuated tools shall be avoided in case of places where explosive/flammable vapours or gases may be present.

xxi) Explosive actuated tools and their explosives shall be stored separately and be taken out and loaded only before the time of immediate use.

xxii) Misfired cartridges of explosive actuated tools shall be placed in a container of water and be removed safely from the project.

xxiii) No worker shall point any power operated / hand tool to any other person especially during loading / unloading.

4.13 WELDING, GOUGING AND CUTTING

4.13.1 Gas cylinders in use shall be kept upright on a custom-built stand or trolley fitted with a bracket to accommodate the hoses and equipment or otherwise secured. The metal cap shall be kept in place to protect the valve when the cylinder is not connected for use.

4.13.2 Hose clamp or clip shall be used to connect hoses firmly in both sides of cylinders and torches.

4.13.3 All gas cylinders shall be fixed with pressure regulator and dial gauges

4.13.4 Non-return valve and Flashback arrester shall be fixed at both end of cylinder and torch.

4.13.5 Domestic LPG cylinders shall not be used for Gas welding and Cutting purpose.

4.13.6 DCP or CO_2 type Fire Extinguisher not less than 5 kg shall be fixed at or near to welding process zone in an easily accessible location. Fire Extinguisher should confirm to IS 2190: 1992.

4.13.7 Use firewatchers if there is a possibility of ignition unobserved by the operator (e.g. on the other side of bulkheads).

4.13.8 Oxygen cylinders and flammable gas cylinders shall be stored separately, at least 6.6 meters (20 feet) apart or separated by a fire proof, 1.6 meters (5 feet) high partition. Flammable substances shall not be stored within 50 feet of cylinder storage areas.

4.13.9 Transformer used for electrical arc welding shall be fixed with Ammeter and Voltmeter and also fixed with separate main power switch.

4.13.10 Welding grounds and returns should be securely attached to the work by cable lugs, by clamps in the case of stranded conductors, or by bolts for strip conductors. The ground cable will not be attached to equipment or existing installations or apparatus.

4.13.11 Use a low voltage open circuit relay device if welding with alternating current in constricted or damp places.

4.13.12 Take precautions against the risk of increased fume hazards when welding with chrome containing fluxed consumables or high current metal inert gas (MIG) or tungsten inert gas (TIG) processes.

4.13.13 Avoid being in contact with water or wet floors when welding. Use duckboards or rubber protection.

4.13.14 All electrical installations shall meet the IS: 5571: 1997 and NFPA 70 for gas cylinder storage area and other hazardous areas.

4.13.15 The current for Electric arc welding shall not exceed 300 A on a hand welding operation.

4.14 DANGEROUS AND HARMFUL ENVIRONMENT

4.14.1 As per BOCWR Rule 40,

i) When internal combustion engines are to be used into a confined space or excavation or tunnel or any other workplace where neither natural or artificial ventilation system is inadequate to keep carbon monoxide below 50ppm, exposure of building workers shall be avoided unless suitable measures are taken and provided by the Contractor.

ii) No worker shall be allowed into any confined space or tank or trench or excavation wherein there is given off any dust, fumes / vapours or other impurities which is likely to be injurious or offensive, explosive or poisonous or noxious or gaseous material or other harmful articles unless steps are carried out by the Contractor and certified by the responsible person to be safe.

4.14.2 In addition, the Contractor shall ensure that all gases, fuels and other dangerous materials and goods are stored and handed in a safe manner and in accordance with the statutory regulations and as required by the Engineer. The Contractor shall be responsible for obtaining the requisite licenses and permission to store and handle such substances.

4.15 FIRE PREVENTION, PROTECTION AND FIGHTING SYSTEM

4.15.1 The Contractor shall ensure that every construction site is provided with fire protection and fire fighting, extinguishing equipment and measures in accordance with statutory regulations and as required by the Engineer. The arrangements shall be sufficient to extinguish any probable fire at construction site. An adequate water supply shall be provided with ample pressure as per the national standards.

4.15.2 Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards

4.15.3 All drivers of vehicles, foreman, supervisors and managers shall be trained on operating the fire extinguishers and fire fighting equipment.

4.15.4 The Contractor shall also give consideration to the provision of adequate fire fighting arrangements within the underground and tunneling operations including the provision of Fire Service compatible hose connections and emergency lighting

4.15.5 All lifting appliances' driver cabin should be provided with a suitable portable fire extinguisher.

4.15.6 Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site subject to consent of the Engineer, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.

4.15.7 If, in the Engineer's opinion, the use of naked lights may cause a fire hazard, the Contractor shall take such additional precautions and provide such additional fire fighting equipment as the Engineer considers necessary. The term "naked light" shall be deemed to include electric arcs and oxyacetylene or other flames used in welding or cutting metals.

4.15.8 Every fire, including those extinguished by the Contractor's Personnel, shall be reported to the Engineer.

4.15.9 Emergency plans and Fire Evacuation plans shall be prepared and issued. Mock drills should be held on a regular basis to ensure the effectiveness of the arrangements and as a part of the programme, the Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.

4.16 CORROSIVE SUBSTANCES

4.16.1 As per BOCWR Rule 44, corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / construction site in a manner that it does not endanger the building /construction worker and suitable PPE shall be provided by the Contractor to the workers during such handling and work. In case of spillage of such substances on the worker, the Contractor shall take immediate remedial measures.

4.17 DEMOLITION

4.17.1 The Contractor shall ensure that

i) all demolition works be carried out in a controlled manner under the management of experienced and competent supervision.

ii) the concerned department of the Government or local authority be informed and permission obtained wherever required. Media shall also be informed regarding this concern.

iii) all glass or similar materials or articles in exterior openings are removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines are put-off and such lines so located or capped with substantial coverings so as to protect it from damage and to afford safety to the building workers and public.

iv) examine the walls of all structures adjacent to the structure to be demolished to determine thickness, method of support to such adjacent structures

v) no demolishing work be performed if the adjacent structure seems to be unsafe unless and until remedial measures life sheet piling, shoring, bracing or similar means be ensured for safety and stability for adjacent structure from collapsing.

vi) debris / bricks and other materials or articles shall be removed by means of

a) chutes

b) buckets or hoists

c) through openings through floors or

d) any other safe means as consented by the Engineer

vii) no person other than building workers or other persons essential to the operation of demolition work shall be permitted to enter a zone of demolition and the area be provided with substantial barricades.

4.18 EXCAVATION AND TUNNELLING

4.18.1 Excavation

4.18.1.1 The Contractor shall ensure

i) where any construction / building worker engaged in excavation is exposed to hazard of falling or sliding material or article from any bank or side of such excavation which is more than 1.5 m above his footing, such worker shall be protected by adequate piling and bracing against such bank or side.

ii) where banks of an excavation are undercut, adequate shoring is provided to support the material or article overhanging such bank.

iii) excavated material is not stored at least 0.65 m from the edge of an open excavation or trench and banks of such excavation or trench are stripped of loose rocks and the banks of such excavation or trench are stripped of loose rocks and other materials which may slide, roll or fall upon a construction building worker working below such bank

iv) metal ladders and staircases or ramps are provided, as the case may be, for safe access to and egress from excavation where, the depth of such excavation exceeds 1.5 m and such ladders, staircases or ramps comply with the IS 3696 Part 1&2 and other relevant national standards.

v) trench and excavation is protected against falling on a person by suitable measures if the depth of such trench or excavation exceeds 1.5 m and such protection is an improved protection in accordance with the design and drawing of a professional Engineer, where such depth exceeds 4m.

4.18.2 Warning Signs and Notices

4.18.2.1 The Contractor shall ensure that

i) suitable warning signs or notices, required for the safety of building / construction workers carrying out the work of an excavation or tunnelling, shall be displayed or erected at conspicuous places in Hindi and in a language understood by majority of such workers at such building such excavation or tunnelling work

ii) such warning signs and notices with regard to compressed air working shall include

a) the danger involved in such compressed air work

b) fire and explosion hazard

c) the emergency procedures for rescue from such danger or hazards.

4.19 WORK PERMIT SYSTEM

4.19.1 The Contractor shall develop a Work Permit system, which is a formal written system used to control certain types of work that are potentially hazardous. A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work Permits form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

4.19.2 A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high-risk activities include but are not limited to:

i) Entry into confined spaces

ii) Work in close proximity to overhead power lines and telecommunication cables.

iii) Hot work.

iv) To dig—where underground services may be located.

v) Work with heavy moving machinery.

vi) Working on electrical equipment

vii) Work with radioactive isotopes.

viii) Heavy lifting operations and lifting operations close to live power line

4.19.3 The permit-to-work system should be fully documented, laying down:

i) How the system works;

ii) The jobs it is to be used for;

iii) The responsibilities and training of those involved; and

iv) How to check its operation;

4.19.4 The Permit-to-Work system shall be submitted to the Engineer for review before application.

4.19.5 A Work Permit authorization form shall be completed with the maximum duration period not exceeding 12 hours.

4.19.6 A copy of each Permit To Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.

4.20 TRAFFIC MANAGEMENT

4.20.1 General

4.20.1.1 The basic objective of the following guidelines is to lay down procedures to be adopted by Contractor to ensure the safe and efficient movement of traffic and also to ensure the safety of workmen in the all Work Areas.

4.20.1.2 The guiding principles to be adopted for safety in construction zone are to

i) Warn the road user clearly and sufficiently in advance.

ii) Provide safe and clearly marked lanes and diversions for guiding road users.

iii) Provide safe and clearly marked buffer and work zones

iv) Provide adequate traffic marshals to regulate the movement of traffic

v) Provide adequate measures that control driver behaviour through construction zones.

4.20.2 Legal Permission

4.20.2.1 In all cases, the Contractor shall employ proper precautions. Wherever operations undertaken are likely to interfere with public traffic, specific traffic management plans shall be drawn up and implemented by the Contractor in consultation with the approval of local police authorities and/or the concerned metropolitan/civil authorities as the case may be.

4.20.2.2 Such traffic management plans shall include provision for traffic diversion and selection of alternative routes for transport of equipment. If necessary, the Contractor shall carry out road widening before commencement of works to accommodate the extra load

4.20.2.3 The primary traffic control devices used in work zones shall include signs, delineators, barricades, cones, pylons, pavement markings and flashing lights.

4.20.2.4 The road construction and maintenance signs which fall into the same three major categories as do other traffic signs, that are Regulatory Signs, Warning Signs and Direction (or guidelines) Signs shall only be used. The IRC: 67 (Code of Practice for Road Signs) provide a list of traffic signs. The size, colours and placement of sign shall confirm to IRC: 67.

4.20.3 Regulatory Signs

4.20.3.1 Regulatory signs impose legal restriction on all traffic. It is essential, therefore, that they are used only after consulting the local police and traffic authorities.

4.20.4 Warning Signs

4.20.4.1 Warning signs in the traffic control zone shall be utilised to warn the drivers of specific hazards that may be encountered.

4.20.4.2 The Contractor shall place detour signage at strategic locations and install appropriate warning signs. In order to minimize disruption of access to residences and business, the Contractor shall maintain at least one entrance to a property where multiple entrances exist.

4.20.4.3 A warning sign shall be installed on all secondary road which merge with the primary road where the construction work is in progress at sufficient distance before it merges with the primary road so as to alert the road users regarding the 'Work in Progress'. The Contractor shall develop the design and obtain the Engineer's consent.

4.20.4.4 Materials hanging over / protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.

4.20.5 Delineators

4.20.5.1 The delineators are the elements of a total system of traffic control and have two distinct purposes:

i) To delineate and guide the driver to and along a safe path

ii) As a taper to move traffic from one lane to another.

4.20.5.2 These channelizing devices such as cones, traffic cylinders, tapes and drums shall be placed in or adjacent to the roadway to control the flow of traffic. These should normally be retro-reflectors complying to IRC: 79 - Recommended Practice for Road Delineators.

4.20.5.3 Traffic cones and cylinders: traffic cones of 500mm, 750mm and 1000mm high and 300mm to 500mm in diameter or in square shape at base and are often made of plastic or rubber and normally have retro-reflectorized red and white band shall be used wherever required.

4.20.5.4 Drums: drums about 800mm to 1000mm high and 300mm in diameter can be used either as channelizing or warning devices. These are highly visible, give the appearance of being formidable objects and therefore command the respect of drivers.

4.20.5.5 Barricades: full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. Same the way barricades protect the road users from the danger due to

construction equipment and other temporary structures.

4.20.5.6 The structure dimension of the barricade, material and composition, its colour scheme, DFCCIL logo and other details shall be in accordance with the Employer's Requirements for Temporary Works.

4.20.5.7 All barricades shall be erected as per the approved design, numbered, painted and maintained in good condition and also Barricade in-charge maintains a barricade register in site.

4.20.5.8 All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricade. Conspicuity shall be ensured by affixing retro reflective stripes of required size and shape at appropriate angle at the bottom and middle portion of the barricade at a minimum gap of 1000mm. In addition minimum one red light or red light blinker should be placed at the top of each barricade.

4.20.5.9 Vehicle and Operator Licenses: the Contractor shall ensure that all his construction vehicles plying on public roads (like dump trucks, trailers, etc.) have proper license to ply on public roads from the State Transport Authority. Drivers holding proper valid license as per the requirements of Motor Vehicles Act shall drive these vehicles

4.20.5.10 No obstruction to traffic: the Contractor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads by the Contractor applying the excuse of work execution.

4.20.5.11 Tow away vehicle: the Contractor shall make arrangements keeping toe away van / manpower to tow away any breakdown vehicle in the traffic flow without loosing any time at his cost.

4.20.5.12 Cleaning of roads: the Contractor shall ensure the cleanliness of roads and footpaths by deploying proper manpower for the same. The Contractor shall have to ensure proper brooming, cleaning washing of roads and footpaths on all the time throughout the entire stretch till the currency of the contract including disposal of sweepings.

4.21 WORK ADJACENT TO RAILWAYS

4.21.1 Whenever work is to be conducted in close proximity to the live railways then the following measures shall need to be addressed:

i) The rules provided for in the Railway's manual shall be followed.

ii) No persons are allowed to encroach onto the railway unless specific authority has been given by the owner.

iii) Adequate protection in accordance with the railway owner's requirements shall be followed. (Provision of Block Inspectors, Flagmen and Lookouts)

iv) All persons shall wear high visibility clothing at all times.

v) Any induction training requirements of the railways shall be strictly observed.

vi) Special care shall be taken to ensure safety of the travelling public, safety of existing railway and other structures located nearby, etc.

4.22 BATCHING PLANT / CASTING YARD

4.22.1 The batching plant / casting yard shall be effectively planned for smooth flow of unloading and stacking the aggregates reinforcements and cement, batching plant, transport of concrete, casting and curing of the segment, stacking the segment and loading the segments to the trucks. As far as possible the conflicts should be avoided.

4.22.2 The batching plant/casting yard shall be barricaded and made as a compulsory PPE zone.

4.22.3 If in case of material unloading area is not maintainable as PPE zone, the same shall be segregated properly and made as a non-PPE zone with appropriate barrications.

4.22.4 Electrical system shall also be suitably planned so that location of diesel generator, if any, location of DBs, routing of cables and positioning of area lighting poles/masts does not infringe on any other utility and pose danger.

4.22.5 Drainage shall be effectively provided and waste water shall be disposed after proper treatment

4.22.6 Time office, canteen, drinking water, toilet and rest place shall be suitably located for the easy access to workers. All the facilities shall be properly cleaned and maintained during the entire period of operation.

4.22.7 Manual handling of cement shall be avoided to a larger extent. Whenever it is absolutely necessary, the workmen shall be given full body protection, hand protection and respiratory protection as a basic measure of ensuring better health.

4.22.8 The PPEs provided to cement handling workmen shall conform to international standards.

4.22.9 Access roads and internal site roads shall be well laid and maintained properly at all time.

4.23 OTHER WORKS TO BE SCRUTINIZED

Other Works including, but not be limited to, Works in the Site (the ROW), the Works in the Borrow Pit, Works in the Quarry and Works on road shall be included to be scrutinised with respect to the accident prevention.

If blasting is anticipated in excavation in rock, preventive measures against accidents and protective measures against environmental/ social impacts shall be of paramount importance.

The Contractor shall include all those items as well as aforementioned work elements to formulate the preventive and protective measures taking into account of envisaged conditions, situations, and particular activities of the Works which may induce accidents or hazard to environment and/or society.

4.24 PERSONAL PROTECTIVE EQUIPMENTS (PPEs)

4.24.1 The Contractor shall provide required PPEs to workmen to protect against safety and / or health hazards. Primarily PPEs are required for the following protection

i) Head Protection (Safety helmets)

ii) Foot Protection (Safety footwear, Gumboot, etc)

iii) Body Protection (High visibility clothing (waistcoat/jacket), Apron, etc)

iv) Personal fall protection (Full body harness, Rope-grip fall arrester, etc)

v) Eye Protection (Goggles, Welders glasses, etc)

vi) Hand Protection (Gloves, Finger coats, etc)

vii) Respiratory Protection. (Nose mask, SCBAs, etc)

viii) Hearing Protection (Ear plugs, Ear muffs, etc)

4.24.2 The PPEs and safety appliances provided by the Contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS). If materials conforming to BIS standards are not available, the Contractor as approved by the Engineer shall procure PPE and safety appliances.

The Contractor shall provide the PPEs which the Contractor deems necessary including,

but not be limited to, safety helmets, safety shoes to all the Contractor's Employees including workmen (including those of its sub-contractors). When and Where the Contractor thinks that he needs to provide the Contractor's Employees including workmen (including those of its sub-contractors) with high visibility clothing as per the following requirement.

- Hi-visibility jacket covering upper body and meeting the following requirements as per BS EN 471:1994:
- Background in fluorescent orange-red in colour
- Jackets with full-length sleeves with two bands of retro reflective material, which shall be placed at the same height on the garment as those of the torso. The upper band shall encircle the upper part of the sleeves between the elbow and the shoulder; the bottom of the lower band shall not be less than 5cm from the bottom of the sleeve.
- Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm^2
- Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm^2
- Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back.
- The bottom strip shall be at a distance of 5cm from the bottom of the vest.
- Strips shall be retro reflective and fluorescent.

4.24.3 Colour coding for helmets

Safety Helmet Colour Code (Every Helmet should have the LOGO* affixed /painted)	Person to use
White	DFCCIL Staffs
Grey	All Designers, Architect, Consultants, etc.
Violet	Main Contractors (Engineers / Supervisors)
Blue	All Sub-contractors (Engineers / Supervisors)
Red	Electricians (Both Contractor and Sub-contractor)
Green	Safety Professionals (Both Contractor and Sub-contractor)
Orange	Security Guards / Traffic marshals
Yellow	All workmen
White (with "VISITOR" sticker)	Visitors

Note: LOGO*

i) Logo shall have its outer dimension 2"X2" and shall be conspicuous

ii) Logo shall be either painted or affixed

iii) No words shall come either on Top / Bottom of Logo

Logo of the corresponding main contracting company for their employees and sub-contracting company for their employees shall only be used.

4.24.4 In addition to the above any other PPE required for any specific jobs like, welding and cutting, working at height, tunnelling etc. shall also be provided to all workmen and also ensure that all workmen use the PPEs properly while on the job.

4.24.5 The Contactor shall not pay any cash amount in lieu of PPE to the workers/sub-contractors and expect them to buy and use during work.

4.24.6 The Contactor shall at all time maintain a minimum of 10% spare PPEs and safety appliances and properly record and show to the Engineer during the inspections.

4.24.7 It is always the duty of the Contactor to provide required PPEs for all visitors. Towards this required quantity of PPEs shall be kept always at the security post.

4.24.8 The Contractor shall ensure that safety equipment and protective clothing is available and used on the site at all material times and those measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing shall be incorporated into the Site SHE Plan.

4.25 VISITORS TO SITE

4.25.1 No visitor is allowed to enter the site without the permission of the Engineer. All authorized visitors should report at the site office. Contractor shall provide visitor's helmet (White helmet with visitor sticker) and other PPEs like Safety Shoe, reflective jacket, respiratory protection etc. as per requirement of the site.

4.25.2 All Visitors shall be accompanied at all times by a responsible member of the site personnel.

4.25.3 The Contactor shall be fully responsible for all visitors' safety and health within the site.

5 Occupational Health and Welfare

5.1 PHYSICAL FITNESS OF WORKMEN

5.1.1 The Contractor shall ensure that his employees/workmen subject themselves to such medical examination as required under the law or under the contract provision and keep a record of the same.

5.1.2 The Contractor shall not permit any employee/workmen to enter the work area under the influence of alcohol or any drugs.

5.2 MEDICAL FACILITIES

5.2.1 Medical Examination

5.2.1.1 The Contractor shall arrange a medical examination of all his employees including his sub-contractor employees employed as drivers, operators of lifting appliances and transport equipment before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every two years up to the age of 40 and once in a year, thereafter.

5.2.1.2 The Contractor shall maintain the confidential records of medical examination or the physician authorized by the Engineer.

5.2.1.3 No building or other construction worker is charged for the medical examination and the cost of such examination is borne by the Contactor employing such worker.

5.2.1.4 The medical examination shall include a full medical and occupational health history, with a clinical examination with particular reference to

i) General Physique;

ii) Vision: - Total visual performance using standard orthorator like Titmus Vision Tester should be estimated and suitability for placement ascertained in accordance with the prescribed job standards.

iii) Hearing: - Persons with normal must be able to hear a forced whisper at twenty-four feet. Persons using hearing aids must be able to hear a warning shout under noisy working conditions.

iv) Breathing: - Peak flow rate using standard peak flow meter and the average peak flow rate determined out of these readings of the test performed. The results recorded at pre-placement medical examination could be used as a standard for the same individual at the same altitude for reference during subsequent examination.

v) Upper Limbs: - Adequate arm function and grip

vi) Spine: - Adequately flexible for the job concerned.

vii) Lower Limbs: - Adequate leg and foot concerned.

viii) General: - Mental alertness and stability with good eye, hand and foot coordination

ix) Any other tests which the examining doctor considers necessary

5.2.1.5 If the Contractor fails to get the medical examination conducted as mentioned above, the Engineer will have the right to get the same conducted through an agency with intimation to the Contractor and deduct the cost and overhead charges from his dues.

5.2.2 First Aid Station

5.2.2.1 The Contractor shall provide at a construction site an occupational health centre (OHC) as referred to as the First Aid Station, and maintain it in good order in terms of Rule 225 (b) of BOCWR. At least one The OHC shall be provided to serve a length of about 30 km along the alignment and shall have:

i) Minimum floor area of 15 square metres, adequately illuminated and ventilated;

ii) Two air-conditioned rooms with smooth walls and intern service;

iii) Adequate and necessary equipments for day-to-day requirement and to manage any medical emergency.

5.2.2.2 The Contractor shall appoint one construction medical officer as in charge of the OHC where the total number of employees is up to one thousand and one additional construction medical officer for every additional one thousand employees or part thereof. The qualifications (Schedule XI of BOCWR) of such construction medical officer shall be:

i) MBBS degree from a medical institute recognized by the Medical Council of India and;

ii) Diploma in industrial health or equivalent post-graduate certificate of training in industrial heath;

5.2.2.3 A medical officer having more than 3 years of experience in policy, execution, advice and safety and health of workers employed in mines, ports and docks, factories, building and other construction work, may be considered without the qualification mentioned at (ii) above.

5.2.2.4 The Contractor shall appoint appropriate full-time staff including one nurse, one dresser-cum-compounder, one sweeper-cum-ward boy with each construction medical officer.

5.2.2.5 The Contractor shall communicate the complete particulars including name, qualification and experience of the construction medical officer, to the inspector having jurisdiction under the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998.

5.2.3 Ambulance Room, Ambulance Van and Stretchers

5.2.3.1 At Construction sites where five hundred (500) or fewer workers are employed, the Contractor shall provide an ambulance room in terms of Rule 226 of BOCWR. Alternatively the Contractor shall make an arrangement with a nearby hospital for providing suitable ambulance rooms. Such ambulance rooms shall have a qualified nurse in charge and its services are available to all workers during working hours.

5.2.3.2 In a Construction site where five hundred (500) or more workers are employed, the Contractor shall provide an ambulance room with a suitably qualified Construction Medical Officer in charge, provided with an effective communication system.

5.2.3.3 An ambulance room shall be equipped at least with the articles listed in Schedule IV, BOCWR (ref: Rule 226).

5.2.3.4 The Contractor shall provide an ambulance van at all construction sites or make an arrangement with a nearby hospital for providing such an ambulance van for prompt transportation of workers who meet with serious accident or who are sick. It is the Contractor's responsibility to ensure that all such ambulances are maintained in good repair and equipped with standard facilities specified in Schedule V of BOCWR.

5.2.3.5 The Contractor shall provide a sufficient number of stretchers at each construction site for use in an emergency.

5.2.4 First-aid Boxes and Emergency Care

5.2.4.1 The Contactor shall ensure at a construction site one First-aid box for 100 workers provided and maintained for providing First-aid to the building workers and other construction workers. Every First-aid box shall be distinctly marked "First-aid" and equipped with the articles specified in Schedule III of BOCWR.

5.2.4.2 At all construction sites, the Contractor shall provide essential life-saving aids and appliances under the supervision of a construction medical officer, where he may be required to handle:

i) Head injuries and spinal injuries;

ii) Bleeding;

iii) Fractures and dislocations of bones and joints;

iv) Crush injuries;

v) Shock, including electric shock;

vi) Dehydration due to any cause;

vii) Snake bite, insect bite, scorpion and bee stings;

viii) Burns including chemical burns;

ix) Bends or divers paralysis;

x) other surgical, gynaecological, obstetric, or pediatric emergencies;

xi) Drowning;

xii) Sunstroke and frost bite

5.2.4.3 Such life saving aids shall be provided to any worker who meets with an accident, before and during his transportation to a hospital and until he is attended by a doctor in such hospital.

5.2.4.4 The Contractor shall also provide other equipments or facilities that may be required for emergency care or treatment of a worker arising from local conditions and specific construction processes.

5.2.5 HIV/ AIDS Prevention and Control

5.2.5.1 The Contractor shall adopt the Employer's "Workplace Policy on HIV / AIDS Prevention and

Control for Workers Engaged by Contractors" and implement it. A copy of the policy is given in Attachment 5 [Workplace Policy on HIV/AIDS Prevention & Control] to Appendix 2. The Contractor shall incorporate an Action Plan to implement the Policy in his Project SHE Plan. He shall prepare and submit a manual for HIV/AIDS prevention and control for his workers in terms of the aforesaid Employer's Policy within 112 days of the date of notification of the Contract.

5.2.6 Prevention of Mosquito Breeding

5.2.6.1 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

i) Empty cans, oil drums, packing and other receptacles, which may retain water shall be deposited at a central collection point and shall be removed from the site regularly.

ii) Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding.

iii) Contractor's equipment and other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained.

iv) Water storage tanks shall be provided.

5.2.6.2 Posters in local language, Hindi and English, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the site.

5.2.6.3 The Contactor at periodic interval shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides. Most effective insecticides shall include SOLFAC WP 10 or Baytex, The Ideal Larvicide etc.

5.2.7 Alcohol, Smoking and Drugs

5.2.7.1 The Contactor shall ensure at all times that no employee is working under the influence of alcohol / drugs which are punishable under Govt. regulations.

5.2.7.2 Smoking at public worksites by any employee is also prohibited as per Govt. regulations. The Contractor shall comply with the legal provisions in this regard, such as, Prohibition of Smoking in Public places Rules, 2008. He shall be solely responsible for any penalty or punitive action by the government authorities on account of violations of the provisions contained in these rules by him or his representatives or his employees or his sub-contractors. Requisite notice boards, posters, etc., shall be put by him, as per the Rules.

5.3 NOISE

5.3.1 General

5.3.1.1 The Contractor shall comply with the codes, regulations and standards with regard to noise pollution and control as notified and amended by Central Government and State Governments from time to time including but not necessarily limited to:

i) Rule 34 and Schedule VI of the Building and other Construction Workers (Regulation of Employment of Service) Central Rules of 1998;

ii) Noise Pollution (Regulation and Control) Rules, 2000;

iii) Environment (Protection) Act, 1986;

iv) Environment (Protection) Amendment Rules, 2000;

v) Central Motor Vehicles Rules, 1989;

vi) Notification on Control of Noise from DG Sets, 2002

5.3.1.2 The Contractor shall consider noise as an environmental constraint in his design, planning and execution of the Works and provide demonstrable evidence of the same on Engineer's request. The Contractor shall, at his own expense, take all appropriate measures to ensure

that work carried out by the Contractor and by his sub-Contractors, whether on or off the Site, will not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

5.3.1.3 Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

i) The Contractor shall ensure that all powered mechanical equipment used in the Works shall be effectively sound reduced using the most modern techniques available including but not limited to silencers and mufflers.

ii) The Contractor shall construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

5.3.1.4 The Contractor shall ensure that noise generated by work carried out by the Contractor and his sub-Contractors during daytime and night time shall not exceed the stipulated maximum permissible noise limits, whether continuously or intermittently. In the event of a breach of this requirement, the Contractor shall immediately re-deploy or adjust the relevant equipment or take other appropriate measures to reduce the noise levels and thereafter maintain them at levels which do not exceed the said limits. Such measures may include without limitation the temporary or permanent cessation of use of certain items of equipment.

5.3.1.5 The Contractor shall take adequate measures to protect the workers against the harmful effects of excessive noise or vibration at all work sites including the limits specified in Schedule VI "Permissible Exposure in Cases of Continuous Noise" of BOCWR, 1998.

5.3.2 Control Requirements

5.3.2.1 Construction material should be operated and transported in such a manner as not to create unnecessary noise as outlined below:

i) Perform Work within the procedures outlined herein and comply with applicable codes, regulations, and standards established by the Central and State Government and their agencies.

ii) Keep noise to the lowest reasonably practicable level. Appropriate measures will be taken to ensure that construction works will not cause any unnecessary or excessive noise, which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise. Use equipment with effective noise-suppression devices and employ other noise control measures as to protect the public.

iii) Schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the construction activities and to occupants of buildings in the vicinity of the construction activities.

iv) The Contractor shall submit to the Engineer a Noise Monitoring and Control Plan (NMCP) under the Contract specific Project Environmental Plan. It shall include full and comprehensive details of all powered mechanical equipment, which he proposes to use during daytime and night time, and of his proposed working methods and noise level reduction measures. The NMCP shall include detailed noise calculations and vibration levels to demonstrate the anticipated noise generation and vibrations by the Contractor.

v) The NMCP prepared by the Contractor shall guide the implementation of construction activity. The NMCP will be reviewed on a regular basis and updated as necessary to assure that current construction activities are addressed. It may appear as a regular agenda item in project coordination meetings, if noise is an issue at any location in the Contract.

5.3.3 Occupational Noise

5.3.3.1 Protection against the effects of occupational noise exposure should be provided when the sound levels exceed the threshold values.

5.3.3.2 When employees are subjected to continuous sound levels exceeding those listed in Schedule VI "Permissible Exposure in Cases of Continuous Noise" of BOCWR, 1998 (see Table 1 below), feasible administrative or Engineering controls should be utilized.

Table 1: Permissible Noise Exposures

Duration per day, Hours	Sound level (slow Response)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

5.3.3.3 If such controls fail to reduce sound levels below the levels of the table, personal protective equipment shall be provided and used to reduce sound levels below the levels of the table.

As a minimum, the Contractor shall provide ear protection to workers who are continuously exposed to high noise levels. Effectiveness of ear protectors shall be checked at a regular interval. Audiometry of the workers exposed to high noise level shall be conducted from time to time.

5.3.3.4 The construction activities shall be limited to the Ambient Noise Standards measured at the nearest affected sensitive receptor, , The Ambient Noise Standards are as given in Table - 2.

Table- 2 Ambient Noise Standards

Category of Area	Limits in dB (A)	
	Day Time #	Night Time #
Residential	55	45
	65	55
Commercial		
Industrial	75	70

Day time mean from 6.00 a.m. to 10.00 p.m. and Night Time shall mean from 10.00 p.m. to 6.00 a.m.

5.3.3.5 At the surface of the construction site during night time hours, the Contractor shall use only equipment that operating under full load meets the noise limits specified in Table-3, if a sensitive receptor would be affected.

5.3.3.6 The adjustments for close in equipment noise measurement shall be made in accordance with Table – 4 for a sensitive receptor.

Table – 3 Noise Emission Limits for Construction Equipment Measured at 50 feet From Construction Equipment

Equipment Category	L_{max} Level dB(A)
Backhoe	80
Bar Bender	75
Chain Saw	81
Compactor	80
Compressor	80
Concrete Mixer	85
Concrete Pump	82
Crane	85
Dozer	85
Front End Loader	80
Generator	82
Gradall	85
Grader	85
Paver	85
Pneumatic Tools	85
Scraper	85
Tractor	84

Table – 4

Adjustments for Close-in Equipment Noise Measurements

(Measurement Values to be subtracted from Measured Sound)

Distance (Feet)	Level to Estimate Sound Level at 50 Feet in dB (A)
19-21	8
22-23	7
24-26	6
27-29	5
30-33	4
34-37	3
38-42	2
43-47	1
48-50	0

5.3.3.7 When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to different levels for various periods of time shall be considered and computed accordingly. The basis of the calculations and the formula adopted shall have the prior consent of the Engineer.

5.3.4 Vibration Level

5.3.4.1 In locations where the alignment is close to historical / heritage structures, the Contactor shall prepare a monitoring scheme prior to construction at such locations. This scheme for monitoring vibration level at such historical / heritage sites shall be submitted to the Engineer for his approval. This scheme shall include:

i) Monitoring requirements for vibrations at regular intervals throughout the construction period.

ii) Pre-construction structural integrity inspections of historic and sensitive structures in project activity.

iii) Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.

iv) The vibration level limits at work sites adjacent to the alignment shall conform to the permitted values of peak particle velocity as given in Table 5 below.

Table – 5 Permitted Values of PPV

Sl. No.	Condition of Structure	Max. PPV in mm/sec
1.	Most structures in "good condition"	25
2.	Most structures in "fair condition"	12
3.	Most structures in "poor condition"	5
4.	Water supply structures	5
5.	Heritage structures/bridge structures	5

5.3.4.2 When Diesel Generator (DG) Sets are used for operation of equipment and machinery, then Ministry of Environment and Forest notification dated 17th May 2002, issued under Environment Protection Act (Protection) Rules, 1986, on noise limits shall apply.

5.4 VENTILATION AND ILLUMINATION

5.4.1 Ventilation

5.4.1.1 The Contactor shall ensure at a construction site of a building or other construction work that all working areas in a free tunnel are provided with ventilation system as approved by the DG and the fresh air supply in such tunnel is not less than 6m3/min for each building worker employed underground in such tunnel and the free air flow movement inside such tunnel is not less than 9m3/min.

5.4.1.2 The oxygen level shall not be less than 19.5% in the working environment.

5.4.2 Illumination

5.4.2.1 The Contactor shall take every effort to illuminate the work site as per the Employer's Requirement illustrated in General Instruction DFCCIL/SHE/GI/0011 of Attachment 7 [Reference for SHE Activities] to Appendix 2.

5.4.2.2 The Contactor shall conduct a monthly illumination monitoring by lux meter for all the locations and the report shall be sent to the Engineer within 7th of the next month and the same shall be reviewed during the monthly SHE Committee meeting.

5.5 RADIATION

5.5.1 The use of radioactive substances and radiating apparatus shall comply with the Govt. regulatory requirements and all subsidiary legislation

5.5.2 Operations involving ionizing radiation shall only be carried out after having been reviewed without objection by the Engineer and shall be carried out in accordance with a method statement.

5.5.3 Each area containing irradiated apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.

5.5.4 Radioactive substances shall be stored, used or disposed off, strictly in accordance with the Govt. Enactments.

5.5.5 The Contactor shall ensure that all site personnel and members of the public are not exposed to radiation.

5.6 WELFARE MEASURES FOR WORKERS

5.6.1 Latrine and Urinal Accommodation

5.6.1.1 Latrine and urinals shall be provided as per Section 33 of BOCWA and maintained as per Rule 243 of BOCWR and shall also comply with the requirements of public health authorities

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5.6.1.2 When women are employed, separate latrine and urinals accommodation shall be provided.

5.6.2 Moving Sites

5.6.2.1 In case of works like track laying, the zone of work is constantly moving at elevated level or at underground level. In such cases mobile toilets with proper facility to drain the sullage shall be provided at reasonably accessible distance.

5.6.2.2 In case the Contactor fail to provide required number of urinals and latrines or fail to maintain it as per the requirements of Public Health laws, the Engineer shall have the right to provide/maintain through renowned external agencies like "Sulabh" at the cost of the Contactor.

5.6.3 Canteen

5.6.3.1 In every workplace wherein not less than 250 workers the Contractor shall provide an adequate canteen conforming to Section 37 of BOCWA, Rule 244 of BOCWR and as stipulated in Rule 247 of BOCWR. The charges for food stuff shall be based on 'no profit no loss' basis. The price list of all items shall be conspicuously displayed in such canteen.

5.6.4 Serving of Tea and Snacks at the Workplace:

5.6.4.1 In terms of Rule 246 of BOCWR, at a building or other construction work where a workplace is situated at a distance of more than 200 m from the canteen provided under Rule 244(1) of BOCWR, the Contractor shall make suitable arrangement for serving tea and light refreshment to such building works at such place.

5.6.5 Drinking Water

5.6.5.1 As per Section 32 of BOCWA the Contractor shall make in every worksite, effective arrangements to provide sufficient supply of wholesome drinking water. Quality of the drinking water shall conform to the requirements of national standards on Public Health.

5.6.5.2 While locating these drinking water facility due care shall be taken so that these are easily accessible within a distance of 200m from the place of work for all workers at all location of work sites.

5.6.5.3 All such points shall be legible marked "Drinking Water" in a language understood by a majority of the workmen employed in such place and such point shall be situated within six meters of any washing places, urinals or latrines.

5.6.6 Creches

5.6.6.1 In every workplace where in more than 50 female workers are ordinarily employed, there shall be provided and maintained a suitable room for use of children under age of 6 yrs, conforming to the provisions of Section 35 of BOCWA.

5.6.7 Labour Accommodation Camps

5.6.7.1 Where workers are based some distance from their normal place of residence, the Contractor shall provide them with suitable and safe accommodation free of charge and shall take all necessary precautions to protect their health and welfare. The accommodation shall conform to the requirements of Section 34 of BOCWA, and include but not be limited to the further measures specified hereunder.

5.6.7.2 All accommodation camps shall be provided at all times with a sufficient supply of clean drinking water (of potable quality according to national legal standards), in suitable and easily accessible locations.

5.6.7.3 The quality of drinking water shall be tested once a fortnight as prescribed in IS 1050:1991 and immediate remedial action shall be taken if quality falls below the expected standard.

Test results shall be provided to the Engineer at least monthly.

5.6.7.4 Storage tanks for potable water shall be located at least 1 m above ground level, and any boreholes or wells shall be 30 m or more from any toilet, drain or other potential source of pollution.

5.6.7.5 Any wells shall be securely covered and provided with a trap door for inspection purposes, which is water and dust-proof and kept locked at all times, except when pump inspections and maintenance are performed.

5.6.7.6 All wells shall be provided with suitable pumps, which shall be inspected and cleaned periodically according to manufacturers' specifications, and repaired or replaced immediately that any malfunction is detected.

5.6.7.7 The Contractor shall provide all accommodation camps with clean and properly equipped and staffed kitchen and canteen facilities to supply breakfast and evening meals for workers.

5.6.7.8 The Contractor shall provide sufficient toilet and bathroom facilities for the numbers of workers accommodated in each camp.

5.6.7.9 Separate accommodation and toilet/bathroom facilities shall be provided for men and women and all facilities shall be kept in full working order at all times, and cleaned and re-equipped daily.

5.6.7.10 The Contractor shall consult the appropriate competent authorities regarding the treatment and disposal of wastewater from each camp, shall obtain the necessary authorization and design and construct the treatment and disposal system accordingly.

5.6.7.11 Wastewater disposal shall comply at all times with effluent discharge standards and any other conditions that may be imposed by the competent authority and the Contractor shall regularly provide the Engineer (and competent authority if required by consent conditions) with data demonstrating that consent conditions are being met.

5.6.7.12 At all camps the Contractor shall provide separate garbage bins for biodegradable and non-biodegradable material, and litter bins in the accommodation blocks; and shall ensure that each site is tidied daily and that garbage is taken away/disposed of at least thrice a week.

5.6.7.13 The Contractor shall provide a laundry facility for the workers at the Labour Camps.

5.7 TRAINING

5.7.1 The Contractor shall prepare and submit to the Engineer for review a detailed Training Plan, describing the training he proposes to impart to each employee (workers and staff), and shall conduct training according to the approved plan and report to the Engineer on implementation each month.

5.7.2 Training shall cover all relevant issues in which additional skills are necessary, or to reinforce or extend existing abilities. Topics shall include but not be limited to working procedures, health and safety, community relations, general behaviour, HIV/AIDS prevention, etc.

5.7.3 Training shall include environmental matters aimed at raising employees' awareness of the environmental and social impacts of their work activities, and the methods and importance of mitigation in a local, national and global context.

5.7.4 The Contractor shall make all necessary arrangements to ensure that staff and workers attend all scheduled training sessions, and sessions to which they may be invited by the Engineer or Employer.

5.7.5 In this connection the Contractor shall also comply with the training provisions contained in Attachment 1 [Contractor's Environmental and Social Management Plan] to Appendix 2.

6 Environmental and Social Protection

6.1 LEGISLATION

6.1.1 The Contractor shall comply at all times with all relevant national and state legislation regarding environmental and social protection, pollution prevention and control, waste management and other relevant environmental and social matters, including but not necessarily limited to the following:

- The Environment (Protection) Act 1986 and Environment (Protection) Amendment Rules 2002 (amended 2003, 2004, 2005, 2006, 2007 and 2008);
- The Indian Wildlife (Protection) Act, 1972;
- The Forest (Conservation) Act, 1980 & rules there under;
- The Noise Pollution (Regulation and Control) Rules 2000;
- The Air (Prevention and Control of Pollution) Act 1981 (amended 1987);
- The Water (Prevention and Control of Pollution) Act 1974 (amended 1988);
- The Ground Water (Regulation, Development and Management) Rules 2007;
- The Municipal Solid Wastes (Management and Handling) Rules 2000;
- The Hazardous Waste (Management, Handling and trans-boundary Movement) Rules, 2008 and its amendment;
- The Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules 2000;
- The Bio-medical Waste (Management and Handling) Rules 1998;
- The Batteries (Management and Handling) Rules 2001.

6.1.2 Some guidance on the applicability and demands of these statutes is given where relevant below. This is not intended to be definitive and it is the Contractor's responsibility to obtain detailed guidance from the appropriate government competent authorities regarding the specific requirements of all applicable legislation.

6.1.3 It is also the Contractor's responsibility to obtain all official approvals, consents or other authorizations as may be necessary in order to comply with the relevant statutes, and to pay all related fees and other costs. The Contractor shall obtain all such authorizations in a timely manner and submit to the Engineer for checking well before commencement of any related construction activity.

6.1.4 The Contractor shall comply with all legislative requirements and any additional conditions imposed by the competent authorities via consent conditions or any other mechanism, throughout the entire construction period.

6.1.5 The Contractor shall regularly provide the Engineer with monitoring results and other data to show clearly that compliance is being maintained, and shall also report to the competent authorities as specified in the consent conditions.

6.1.6 The Contractor shall display banner at Site on 5th of June every year to observe Word Environment Day with logo and theme to promote awareness on environment protection

6.2 SITE PREPARATION

6.2.1 Preservation of Trees

6.2.1.1 The Contractor shall not cut any tree within or outside the work site without the explicit written approval of the Engineer and the government Forest Department.

6.2.1.2 The Contractor shall design all the Temporary and Permanent Works in such a way as to retain trees to the extent possible, without impeding operational requirements and safety.

6.2.1.3 Before construction begins, the Contractor shall physically mark the agreed boundaries of all areas in which vegetation is to be removed, and protect any areas in which trees or vegetation are to be retained, by robust, readily visible fencing, with signs prohibiting entry of vehicles or personnel.

6.2.2 Vegetation Removal

6.2.2.1 The Contractor shall remove vegetation from within the ROW only after he receives written authorization from the Engineer,

6.2.2.2 The Contractor shall prohibit workers from cutting trees or deliberately damaging any vegetation outside the ROW, including in the vicinity of accommodation camps; and shall ensure that all such camps are provided with adequate power and cooking fuel at all times.

6.2.2.3 The Contractor shall keep appropriate records of the agreed ROW boundaries and other measures and shall regularly monitor to ensure that no vegetation is damaged outside.

6.2.3 Topsoil Removal and Storage

6.2.3.1 Stockpiles shall be located in purpose-built storage areas, preferably within the ROW, which are more than 500 m from any inhabitation or waterway, in areas that are not subject to flooding.

6.2.3.2 The Contractor shall prepare and submit a plan showing stockpile locations to the Engineer for prior approval.

6.2.3.3 Stockpile slopes shall not exceed 1:2 and height shall not exceed 2 m; and surfaces shall be covered with securely-fixed tarpaulins or via an alternative method subject to approval by the Engineer.

6.2.3.4 A Stockpile Areas Management Plan, particularly for prevention of runoff/dust control of fine particles, shall be submitted by the Contractor to the Engineer for his approval.

6.2.3.5 The Contractor shall prohibit the entry of vehicles and storage of objects in stockpile areas to prevent soil compaction, and shall keep multiple-handling of stored soil to a minimum.

6.2.3.6 The Contractor shall utilize removed topsoil in this project as much as possible: in top dressing embankments and fill slopes; reinstating borrow pits and other disturbed areas after use; and for other purposes.

6.2.4 Sites of Temporary Works

6.2.4.1 To prevent unnecessary damage of land, the Contractor shall locate sites for all temporary works and storage areas except the Borrow Pits, the Quarries, and the Stock Pile Areas (whereas, the Stockpile areas may be located in the ROW) as described in Clause 4.3 of GENERAL SPECIFICATIONS VOL. II [Temporary Works] within the approved ROW wherever possible.

6.2.4.2 If there is no alternative to locating certain temporary worksites outside the ROW, the Contactor shall ensure that all such sites are located at least 500 m from the nearest inhabited area, on land that owners are willing to sell or lease.

6.2.4.3 The Contractor shall be solely responsible for negotiating the sale or rental of such land from the legal owner(s).

6.2.4.4 The Contractor shall reinstate the land after use to the entire satisfaction of the legal owner(s) and the Engineer.

6.3 LABOUR ACCOMMODATION CAMPS

6.3.1 In the pre-construction period the Contractor shall identify potential locations for worker

accommodation camps at which the social and environmental impacts of building and operating the camps are expected to be minimal. All such locations shall be at least 500 m from the nearest inhabited area, within the project ROW, or if outside the ROW shall be on land that the owners are willing to lease or sell.

6.3.2 The Contractor shall submit to the Engineer a document comparing the environmental and social impacts of each proposed site for labour camps, and explaining proposed arrangements for worker accommodation, facilities, welfare, health/safety and waste management.

6.3.3 Final camp locations shall be selected on the basis of the Engineer's review, after which it shall be the Contractor's sole responsibility to obtain all necessary approvals/authorisations from national, state and local authorities for the establishment and operation of all camps. Copies of all necessary approvals shall be provided to the Engineer in advance of any work on the proposed sites.

6.3.4 If chosen Camp site(s) are outside the ROW, it is the Contractor's sole responsibility to arrange to rent or purchase the land from the legal owner(s).

6.3.5 Camp design, construction and operation shall comply in full with any and all conditions imposed by national, state or local authorities and by the Engineer, and with all appropriate legislation. The Contractor shall regularly provide the Engineer (and competent authorities if required by the consent conditions) with appropriate evidence to demonstrate that compliance is being maintained.

6.4 BORROW PITS AND QUARRIES

6.4.1 To avoid impacts on the landscape and topography from indiscriminate excavation, the Contractor shall re-use material from cutting and other necessary excavation work in the project as much as possible, and shall source all other required soil, stone, aggregate and other construction materials from properly licensed quarries as far as possible.

6.4.2 In the case of borrow pits, the Contractor shall identify suitable site(s) and submit details, including a location map and proposed transportation routes, to the Engineer for consent. The location and exploitation of borrow pits shall comply with IRC 10: 1961 and no borrow pits or access roads shall be located less than 200 m from any inhabitation.

6.4.3 Consent from the Engineer is dependent on appropriate selection of locations to minimize environmental and social impacts (to be confirmed by site inspection), so the Contractor should include with his application an assessment of the potential impacts of the borrow operation and a description of any proposed mitigation.

6.4.4 On receipt of the consent from the Engineer, the Contractor shall be solely responsible for negotiating the sale or rental of all required land from the legal owner(s).

6.4.5 The Contractor is also solely responsible for obtaining all consents and approvals from government competent authorities as required by law, and shall provide the Engineer with copies of all necessary approvals and landowner agreements (including confirmation of receipt of payments made as per the agreement with the legal land owner(s)), before commencing any work associated with the borrow operation .

6.4.6 Borrow pit operations shall only commence on receipt of written authorization from the Engineer.

6.4.7 After completion of the borrow operations, the Contractor shall reinstate the land to the entire satisfaction of the legal owner(s) and the Engineer.

6.5 CONSTRUCTION WATER AND RAIN WATER HARVESTING

6.5.1 The Contractor shall bear sole responsibility for organizing the supply and storage of water

needed for the construction process and shall make all necessary arrangements with the relevant government authorities and comply in full with any charges or other conditions specified by them.

6.5.2 In advance of any water use the Contractor shall inform the Engineer of proposed water sources and arrangements made, and shall provide the Engineer with copies of all official approvals.

6.5.3 The Contractor shall ensure that usage volumes or rates of extraction agreed by the competent authorities are not exceeded.

6.5.4 The Contractor shall prepare and submit to the Engineer plans to minimise the wastage of water and prevent runoff into surface and underground water sources; and shall implement the water conservation and pollution prevention plans on approval by the Engineer. In certain cases, it may be advantageous to convert borrow pit area into community ponds to augment the groundwater condition, with the consent of the land owner(s) and local Panchayat.

6.5.5 Necessary permissions shall be obtained from the competent authority before abstraction of surface water or groundwater. Groundwater abstraction for construction purposes shall not be done in the area listed by Central Ground Water Authority as notified for control and regulation of ground water.

6.5.6 The Contractor shall not abstract water from existing ponds without the consent of the local people/Panchayat.

6.5.7 Where feasible as part of the construction works the Contractor shall develop plans and implement rainwater harvesting schemes as per Central Ground Water Board (CGWB) guidelines. The Contractor shall be responsible for obtaining approval from the competent authority for any such proposals.

6.6 WATER QUALITY

6.6.1 General

6.6.1.1 The Contractor shall comply in full with all relevant requirements of national legislation governing water quality, including but not necessarily limited to The Environment (Protection) Act 1986 and Environment (Protection) Amendment Rules 2002 (amended 2003, 2004, 2005, 2006, 2007 and 2008), and the Water (Prevention and Control of Pollution) Act 1974 (amended 1988).

6.6.1.2 The Contractor shall comply at all times with any specific requirements of these and any other relevant statutes, including prescribed water quality limits and standards as per the following IS codes/CPCB norms/EP rules, and any other relevant legislation, code or guidelines:

- Drinking Water Quality Standards (as per IS: 10500)
- Water Quality Criteria and Standards for Freshwater Classification (CPCB, 1979)
- Tolerance Limits for Inland Surface Waters (as per IS:2296)
- General Standards for Discharge of Effluents [as per Environment (Protection) Rules, 1986]

6.6.1.3 The Contractor is solely responsible for obtaining all consents and approvals from government competent authorities as required by national laws on water quality, and shall provide the Engineer with copies of all necessary approvals before construction begins.

6.6.1.4 The Contractor shall comply in full with any conditions imposed by the competent authorities when granting consent, and shall regularly provide the Engineer (and competent authorities if required by the consent conditions) with appropriate evidence to demonstrate that compliance is being maintained.

6.6.1.5 Notwithstanding the above, the Contractor is expected to maintain the highest standards of environmental performance throughout all his work and to take all necessary precautions to avoid causing any significant pollution of any natural water, both surface and underground. Precautions shall include but not be limited to those specified in clauses 6.6.2 to 6.6.6 below.

6.6.2 Flood Prevention

6.6.2.1 To maintain natural drainage and avoid causing flooding of construction sites or surrounding areas, the Contractor shall not dispose of any material into rivers, streams, natural culverts or drains.

6.6.2.2 The Contractor shall incorporate suitable drainage structures into all construction sites, sufficient to prevent flooding of the site and adjacent areas during monsoon rainfall, and shall provide the Engineer with written proposals and drawings of proposed drainage and flood prevention measures for approval before construction begins.

6.6.3 Siltation Control

6.6.3.1 The Contractor shall not obtain any construction materials from the beds of rivers, streams, lakes or other water bodies, except with prior approval of the competent authority. He shall bear related all costs and abide by the stipulated conditions, if any.

6.6.3.2 The Contractor shall install silt runoff prevention measures as consented by the Engineer at the base of embankments constructed near surface water bodies; and shall maintain such measures in place until embankment slopes are fully stabilized by grassing or other means as approved.

6.6.3.3 Stockpiled soil, sand and any other fine-grained construction materials shall be covered with secure tarpaulins or via an alternative method subject to the approval by the Engineer, and stored in fully waterproof enclosures, located more than 100 m from any surface water.

6.6.3.4 Where construction work is conducted in a natural waterway the Contractor shall prepare and submit to the Engineer for approval before such work begins, detailed plans to minimize and contain sediment disturbance.

6.6.3.5 During the construction period, the Contractor shall arrange for removal/cleaning of deposited silt from drainage channels and outlet points within the project influence area before the monsoon season. Rejuvenation of the drainage system by removing encroachments/congestions shall also be ensured.

6.6.4 Slope Protection and Erosion Control

6.6.4.1 To minimize slope erosion and runoff of silt-laden rainfall, the Contractor shall conduct all cut and fill operations outside the monsoon season; and shall protect all cut slopes as per the design requirements as soon as the final profile has been reached.

6.6.4.2 While slopes are being cut or constructed, if areas are to be left uncovered for more than 5 days before further profiling, soil surfaces shall be suitably protected temporarily as consented by the Engineer, to reduce erosion.

6.6.4.3 The Contractor shall provide adequate temporary or permanent drainage alongside all slope areas before excavation/cutting begins, and shall provide adequate settlement lagoons/chambers to collect runoff and allow sediment to settle out before water is discharged to a natural waterway.

6.6.4.4 Soil erosion shall be visually checked by the Contractor periodically on slopes and high embankment areas. In case soil erosion is found, suitable measures shall be taken to control soil erosion.

6.6.4.5 The Contractor shall be responsible to ensure that all the slopes are fully stabilized and protected as per the design requirements before being taken over by the Employer

6.6.5 Wastewater Disposal

6.6.5.1 Notwithstanding the requirements of any consent conditions applied by the statutory authority, all site drainage and waste water shall be adequately treated including installation of a Sewage Treatment Plant, if required, before disposal to the natural environment; and no liquid or other material shall be allowed to drain away untreated.

6.6.5.2 Site drainage shall be retained in lagoons or chambers for a sufficient time to allow settlement of a significant proportion of the suspended sediment before water is decanted to a natural water body.

6.6.5.3 Wastewater from toilets, washrooms and other sanitary facilities shall be treated to national legal standards and discharged as prescribed by consent conditions applied by the statutory authority.

6.6.5.4 Any oil and grease contents of waste water shall be trapped and recovered before discharge to drain or water body.

6.6.5.5 Sufficient toilet and washroom facilities shall be provided at all construction sites for the numbers of workers and staff on site at all times, and all such facilities shall be fully cleaned and re-equipped at least daily.

6.6.6 Accidental Spillage

6.6.6.1 The Contractor shall comply in full with the requirements of all relevant legislation pertaining to the storage, handling and disposal of hazardous chemicals used in the construction process, including, but not necessarily limited to the Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules 2000, and the "Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2008" and its amendment.

6.6.6.2 The Contractor is solely responsible for obtaining any consents and approvals that may be necessary under these and any other relevant statutes, for complying with any consent conditions set by the competent authority, and for providing the Engineer (and competent authority if necessary) with regular monitoring data demonstrating that those conditions are being met.

6.6.6.3 The Contractor shall prepare a detailed Pollution Prevention and Control Plan (PPCP), with contents as specified in Attachment 1 to Appendix 2 of the Employer's Requirements. *Inter alia* this shall describe how compliance with the above legislation will be achieved, how all hazardous materials will be stored and how any spillages will be contained and treated. It shall also describe how pollution from contact between machinery and water will be avoided when work is conducted in or on rivers and other waterways.

6.6.6.4 The completed PPCP will also describe pollution control measures relating to other media (land and air – Refer Attachment 1 to Appendix 2 of the Employer's Requirements) and shall be submitted to the Engineer for review before construction begins.

6.6.6.5 The Contractor shall adopt all necessary measures during the monsoon season to avoid soil erosion and sedimentation, accidental spillage, accident risks to workers and damage to already constructed works, near the water bodies considering their nature, extent and site-specific conditions.

6.6.6.6 The Contractor shall locate all parking areas, vehicle/machinery or equipment maintenance yards, and storage areas for fuel, oil or any other potentially toxic materials within the ROW of construction areas, and more than 100 m from any water body.

6.6.6.7 All parking areas and vehicle/plant maintenance yards shall be floored with waterproof hard-standing, and drainage from all such areas shall be collected and treated as required to meet legal discharge standards and any other consent conditions.

6.6.6.8 Fuel, oil and any other hazardous liquids shall be stored only in concrete-floored and bunded areas; and the volume of the bunded areas must be sufficient to retain all the stored liquid in the event of leakage.

6.6.6.9 Refuelling shall only be conducted in areas that are dedicated for this purpose and provided with floors of waterproof concrete, from which all drainage is collected and passed through an oil/water separator before discharge.

6.6.6.10 Accurate records shall be kept documenting all fuelling and maintenance, plus any spill events and action taken.

6.6.6.11 Appropriate spill containment and clean-up equipment shall be provided at all fuel storage, refueling and vehicle maintenance areas; and operators shall be appropriately trained in their normal activities as well as pollution control and remediation.

6.6.6.12 Waste oil from vehicle maintenance shall be collected in sealed containers and stored safely in sealed damage-proof containers prior to collection and disposal.

6.6.6.13 All waste oil shall be disposed of as per the Central Pollution Control Board (CPCB) and/or State Pollution Control Board (SPCB) guidelines as applicable.

6.7 AIR QUALITY

6.7.1 General

6.7.1.1 The Contractor shall comply in full with all relevant requirements of national legislation governing air quality, including but not necessarily limited to The Environment (Protection) Act 1986 and Environment (Protection) Amendment Rules 2002 (amended 2003, 2004, 2005, 2006, 2007 and 2008), and the Air (Prevention and Control of Pollution) Act 1981 (amended 1987).

6.7.1.2 The Contractor shall comply at all times with any specific requirements of these and any other relevant statutes, including prescribed air quality limits and standards as follows:

- National Ambient Air Quality Standards (NAAQS) amended till date; and
- General emission standards as per the Environment (Protection) Rules, 1986.

6.7.1.3 The Contractor is solely responsible for obtaining all consents and approvals from government competent authorities as required by national laws on air quality, and shall provide the Engineer with copies of all necessary approvals before construction begins.

6.7.1.4 The Contractor shall comply in full with any conditions imposed by the competent authorities when granting consent, and shall regularly provide the Engineer (and competent authorities if required by the consent conditions) with appropriate evidence to demonstrate that compliance is being maintained.

6.7.1.5 Notwithstanding the above, the Contractor is expected to maintain the highest standards of environmental performance throughout all his work and to take all necessary precautions to avoid causing any significant air pollution. Precautions shall include but not be limited to those specified in clause 6.7.2 below.

6.7.2 Dust Control

6.7.2.1 The Contractor shall water all unpaved roads in all construction sites at least thrice daily in dry weather to reduce dust; and shall apply the same watering regime to areas of exposed soil during dry and windy weather.

6.7.2.2 All fine-grained loose material (soil, sand, etc) shall be covered with secure tarpaulins when stored on site and when carried on- or off-site on trucks.

6.7.2.3 Vehicle speeds on all construction sites shall be limited to a maximum of 20 kmph at all times.

6.7.2.4 Wheel washing facilities shall be provided and used by all vehicles at all site exits prior to travelling on public roads.

6.7.2.5 Crushers and any other machinery likely to produce significant dust shall be located at least

1 km from the nearest inhabitation, downwind of the predominant wind direction. Permission/NOC shall be obtained from the State Pollution Control Board for installing and operating all crusher units. The Contractor shall provide the Engineer with copies of relevant certification to show that all such machinery is fitted with appropriate dust reduction/extraction equipment.

6.7.2.6 The personal working in dust conditions shall be provided with dust protection PPEs

6.8 NOISE

6.8.1 The Contractor shall comply in full with all relevant requirements of national legislation governing noise, including but not necessarily limited to The Environment (Protection) Act 1986 and Environment (Protection) Amendment Rules 2002 (amended 2003, 2004, 2005, 2006, 2007 and 2008), and the Noise Pollution (Regulation and Control) Rules 2000.

6.8.2 The Contractor shall comply at all times with any specific requirements of these and any other relevant statutes, including prescribed noise limits and standards as follows;

- Permissible Exposure Levels of Impulse or Impact Noise for Work Zone Area [as per Model Rules of Factories Act, 1948]
- Permissible Exposure in Case of Continuous Noise for Work Zone Area [as per Model Rules of Factories Act, 1948].
- Ambient Noise Level Limits (in Leq dB(A)),as per Environment Protection Rules, 1986, Schedule III.

6.8.3 The Contractor is solely responsible for obtaining all consents and approvals from government competent authorities as required by national laws on noise pollution, and shall provide the Engineer with copies of all necessary approvals before construction begins.

6.8.4 The Contractor shall comply in full with any conditions imposed by the competent authorities when granting consent, and shall regularly provide the Engineer (and competent authorities if required by the consent conditions) with appropriate evidence to demonstrate that compliance is being maintained.

6.8.5 Notwithstanding the above, the Contractor is expected to maintain the highest standards of environmental performance throughout all his work and to take all necessary precautions to avoid causing any significant noise pollution or nuisance. Precautions shall include but not be limited to those specified in clauses 6.8.6 and 6.8.7 below.

6.8.6 The Contractor shall cease any activity likely to produce significant noise (such as concrete mixing, excavation, operation of heavy vehicles, etc) at all locations that are less than 150 m from inhabited areas, between the hours of 10.00 pm and 6.00 am, and on Sundays and public holidays. Work sites near sensitive locations like schools and hospitals shall be surrounded by the temporary noise barriers.

6.8.7 As far as possible, stationary noise making equipment shall be located along un-inhabited areas.

6.9 POLLUTION FROM VEHICLES, MACHINERY AND EQUIPMENT

6.9.1 In addition to the requirements of any consent conditions imposed by the competent authorities, the Contractor shall take the measures listed below to reduce the production of noise and pollution of air, land and water by vehicles, machinery and other equipment.

6.9.2 All vehicles, machinery or other equipment used in the construction process shall be three years or less from the date of manufacture at the commencement date of the Services.

6.9.3 All vehicles, machinery or other equipment shall conform to the requirements of The Central Motor and Vehicle Act 1988 and other relevant national and state legislation and

the appropriate norms of the Bureau of Indian Standards (BIS), and shall be fitted with the most up-to-date appropriate equipment for the reduction of noise, and atmospheric and other emissions.

6.9.4 All vehicles, machinery and other equipment shall be maintained, serviced and repaired where necessary, according to manufacturers' specifications and recommended schedules; the Contractor shall keep a schedule and records of all such activities and provide these to the Engineer for inspection on request.

6.9.5 The Contractor shall conduct and document regular inspections by appropriately qualified experts to identify and remediate any mechanical defects and wear and tear before the performance of the vehicles, machinery or other equipment affects their fitness for purpose or environmental performance.

6.9.6 The Contractor shall also conduct and document regular inspections of all vehicles, machinery or other equipment to be used in bridge or culvert construction or any other work near waterways, to confirm that: all plant is clean, fit for purpose and there is no leakage of oil or grease; and that plant left on site is safely and appropriately stored in facilities with suitable spill prevention provision.

6.10 SOLID WASTE MANAGEMENT

6.10.1 The Contractor shall comply in full with the requirements of all relevant legislation pertaining to the management and disposal of solid waste, including, but not necessarily limited to the Environment (Protection) Act 1986 and Environment (Protection) Amendment Rules 2002 (amended 2003, 2004, 2005, 2006, 2007 and 2008), and the Municipal Solid Wastes (Management and Handling) Rules 2000 and local legislation governing construction and demolition wastes.

6.10.2 The Contractor is solely responsible for obtaining any consents and approvals that may be necessary under these and any other relevant statutes, for complying with any consent conditions set by the competent authority, and for providing the Engineer (and competent authority if necessary) with regular data demonstrating that those conditions are being met.

6.10.3 The Contractor shall prepare a detailed Solid Waste Management Plan (SWMP), which shall be submitted to the Engineer for review before construction begins.

6.10.4 When preparing the SWMP the Contractor shall contact the relevant authorities at state and local level and make arrangements to deposit waste materials from construction sites at existing sanitary landfills wherever possible, or if such facilities are not available within a reasonable distance from any locations, at alternative licensed waste disposal sites.

6.10.5 The SWMP shall describe how compliance with the above legislation will be achieved; and how all solid waste will be collected and stored at Work Areas, removed and transported for disposal, and where and how it will be deposited. Special arrangements for hazardous waste shall be described, including the manner in which such waste will be deposited to prevent escape of any material over the long term. Measures to keep sites in a tidy and sanitary condition will also be described, along with measures to minimise waste and re-use and recycle used materials. other contents will be as specified in Attachment 1 to Appendix 2 of the Employer's Requirements.

6.10.6 No potentially polluting material is to be deposited at unlicensed sites and no waste shall be burnt.

6.10.7 With the approval of the Engineer, surplus inert material (excavated spoil, building rubble, etc.) that cannot be used as infill or for other purposes on the project may be deposited at unlicensed sites with the consent of the owner, if it can be retained indefinitely without causing pollution or other environmental hazard or damage, and if it does not create an unsightly appearance. Public perception and consent from the village Panchayats about the location of debris disposal site has to be obtained before finalizing the location.

6.11 ARCHAEOLOGY

6.11.1 When the working near scheduled Ancient Monuments or sites, the Contractor shall obtain NOC from the Archaeological Survey of India for any activities within the Prohibited Area (100m from the Protected Limit) and Regulated Area (200m from the Protected Limit) according to Ancient Monuments and Archaeological Sites and Remains Act 1958.

6.11.2 The Contractor shall commission archaeological expert(s) to conduct a detailed assessment of all Work Areas to estimate the risk of encountering previously undiscovered historical remains during excavation and prepare a Physical Cultural Resources Management Plan (PCRMP). The PCRMP shall set out procedures to be adopted to minimise the risk of causing accidental damage during excavation work and other ground disturbance and to ensure that any material discovered is recognised and dealt with appropriately.

6.11.3 *Inter alia* the PCRMP shall include a "chance finds" procedure that involves: a qualified field archaeologist, familiar with international best practice, observing excavation work in any especially sensitive areas; stopping work immediately to allow further investigation if any finds are suspected; and calling in the State or Central archaeological authority in the event of a significant find and taking any action they require to ensure its removal or protection *in situ*.

6.12 CONTRACTOR'S DEMOBILIZATION

6.12.1 The Contractor shall prepare Restoration Plans for all temporarily occupied sites (including but not limited to construction sites, storage yards, accommodation camps, borrow areas, etc) and shall submit these to the Engineer for approval well before each site is vacated. Each plan shall include but not be limited to the measures specified in Clauses 6.12.2 to 6.12.6 below.

6.12.2 All garbage, debris and hazardous materials shall be removed and deposited as directed by competent authorities, at approved disposal locations.

6.12.3 All equipment, plant and other materials shall be removed from all sites, all trenches shall be filled, and any waste disposal pits shall be filled and sealed.

6.12.4 Infrastructure such as buildings, water supply, etc may be left *in situ* if desired by the landowner, otherwise all structures shall be demolished and the debris removed for disposal, and all wells and sewage treatment and disposal systems shall be sealed and left in a sanitary condition.

6.12.5 Final landscaping shall be as agreed with the landowner, and may include such reasonable measures as slope grading, grass seeding, tree planting, etc.

6.12.6 The Contactor shall report completion of site restoration to the Engineer, who shall approve site closure if all actions have been completed according to the Restoration Plan to the satisfaction of the landowner(s).

6.13 AUDIT AND REPORTING

6.13.1 The Contractor shall audit all of the activities described in his ESMP and ESMoP at weekly, bi-weekly and/or monthly intervals or as otherwise required by the Engineer and shall keep appropriate records of this activity.

6.13.2 The Engineer will inspect the Contractor's environmental and social performance in the course of his normal supervision activities, and the Contractor will cooperate by providing access to sites, equipment, staff, records, etc. as may be requested by the Engineer either in writing or verbally.

6.13.3 At least two week's notice will be given to the Contractor by the Engineer of any formal audit

of the Contractor's environmental and social performance, and the notice will indicate the areas and activities to be audited and any special requirements, including records to be provided. The Contractor's Senior Environment Officer and other appropriate staff shall accompany the Engineer's staff throughout such an audit as may be requested by the Engineer.

6.13.4 The contractor shall submit a written report to the Engineer at the end of each week and a more detailed report to the Engineer and Employer at the end of each month, describing:

- Progress in providing the mitigation measures specified below and described in para 2.4 of the ESMP (refer Attachment 1 [Contractor's Environmental and Social Management Plan] to the Appendix 2);
- Progress in providing the mitigation specified in para 2.5 of the ESMP (refer Attachment 1 [Contractor's Environmental and Social Management Plan] to the Appendix 2);
- The results of each monitoring activity specified in the ESMoP as per Attachment 2 [Contractor's Environmental and Social Monitoring Plan] to Appendix 2), with an explanation of conclusions drawn from the results;
- Any other observations regarding environmental or social matters;
- Any recommendations or requests for authorisation of proposed changes in implementation of the ESMP or ESMoP, with an explanation/ justification.

6.13.5 All reports shall be in English, in a format to be agreed with the Engineer beforehand.

6.13.6 The contractor shall also meet with the Engineer and his Environmental Experts for ad-hoc formal and informal discussions as may be requested by the Engineer; and shall report verbally to the Engineer immediately there is any significant non-compliance with consent conditions or prescribed standards, or any significant deviation from the implementation of mitigation as described in the ESMP.

Attachments to Appendix 2

ATTACHMENT 1

CONTRACTOR'S ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

1. General

1.1 The Contractor shall prepare an Environmental and Social Management Plan (ESMP) setting out in detail how he proposes to manage and minimize the environmental and social impacts of his activities throughout the construction period.

1.2 The Contractor's ESMP shall be based on environmental considerations submitted with the Bid and shall have the content shown in the next section [Contents of ESMP].

1.3 The Contractor shall submit his ESMP for review by the Engineer within 42 days after the Commencement Date of the Services, and shall amend the ESMP to address any comments made by the Engineer and submit a Final ESMP within 28 days of receipt of comments.

1.4 The Final ESMP shall be binding on the Contractor for the duration of the Services

2. Content of ESMP

2.1 Contractor's Environmental Policy

2.1.1 The first section of the ESMP shall contain a statement of the Contractor's intent with respect to the environment and the management of environmental and social impacts, which sets the framework for, and guides, all other aspects of the plan.

2.2 Management Responsibility

2.2.1 This section of the ESMP shall name the most senior manager in the contracting company or at their project site as having overall responsibility for environmental management, with an explanation of how that responsibility is delegated down to each level of management. It shall also name the Chief Environmental Officer who is responsible for day-to-day environmental management, supervision and monitoring at all work-sites, and has company authority to stop construction works if environmental non-compliance is observed.

2.2.2 At each active construction site there must be at least one named person with delegated responsibility for environmental management on each shift. This person will be referred to as the Senior Environment Officer (SEO), and on larger sites he may be assisted by Environment Managers (EM), who will work under his direction conducting routine monitoring, data collection, etc.

2.2.3 Environmental affairs include social issues, and the ESMP must also identify a Community Liaison Officer (CLO) who will deal with community relations and liaise on behalf of the Contractor with people who may be affected by the construction process. The CLO shall integrate all of his activities with those of other social specialists responsible for implementing the Resettlement and Rehabilitation Plan (RRP) for the project on behalf of the Employer; and shall operate within the framework of the Entitlement Matrix and Grievance Redress Procedure established by the RRP.

2.3 Management Contacts

2.3.1 The office and home telephone or radio contacts (including mobile / cell phone contact) shall be listed for all named persons having environmental management responsibility.

2.4 Mitigation Measures

2.4.1 The description of the approach to environmental and social mitigation is the major part of the Contractor's ESMP. In this section the Contractor shall deal in turn with each of the mitigation measures identified as his responsibility in the S-ESIMMS for the project (JICA 2009) and explain in detail how he proposes to provide the mitigation as specified in Clause 6 of the Appendix 2 [SHE Requirements] to the Employer's Requirements

2.4.2 This should not simply repeat the contents from Clause 6 of the Appendix 2 [SHE Requirements] to the Employer's Requirements but shall explain in detail: a) the action or series of actions the Contractor will take to comply with each clause or sub-clause; b) responsibility for each action; c) the programme for each action; d) how the Contractor proposes to monitor the provision and effects of each action; and e) parameters or performance indicators to be monitored.

2.5 General Environmental Management

2.5.1 In this section the Contractor shall identify and describe the more general actions he proposes to take to manage and mitigate the environmental and social impacts of his day-to-day operations. These shall be presented and explained in the same way as the specified mitigation measures, as in Clause 2.4.2 (a-e) above.

2.5.2 Actions shall include, but not be limited to, those specified in Clauses 2.5.3 – 2.5.9 below (any items that are adequately covered in Section 2.4 need not be repeated).

2.5.3 *Construction Site Management*

General environmental management at construction sites shall include at least the following:

- Dedicated concrete-floored areas for vehicle maintenance, from which all drainage passes through an oil/water separator and sediment trap;
- Dedicated concrete-floored areas for vehicle washing, also with drainage via an oil/water separator and sediment trap;
- Storage of all liquid fuel, lubricants and other toxic liquids in concrete-floored and bunded areas, the volume of which is at least equivalent to that of all stored liquids;
- Watering of site roads and other exposed soil during the dry season to suppress dust, with water tankers permanently available for this purpose;
- Collection of drainage at all sites and passage into settlement tanks/sediment traps before discharge;
- Treatment of all sewage and any other liquid discharges to national effluent standards and/or consent conditions before discharge;
- All point-source atmospheric emissions (e.g. from crushers, batching plants, engines, generators, etc) shall comply with national standards or international standards if a national standard is not available;
- All motor-driven generators, compressors, pumps, etc. to be properly silenced to suppress noise to national standards or international standards if a national standard is not available;

- Site lighting and use of machinery near inhabited areas to be limited to normal daytime working hours;
- Disposal of solid waste by arrangement with local municipalities;
- No use or disposal of nationally or internationally proscribed toxic and hazardous substances;
- Issuance of a Code of Practice to all workers, specifying required behaviour, including but not limited to :
    - No hunting, fishing, timber collection or lighting of fires;
    - No discarding of litter or other waste;
    - Proper usage of toilets and washrooms;
    - other behaviour to comply with defined local cultural and religious sensitivities;
    - No unauthorized entry onto private property;
    - Immediate dismissal for any transgression.

2.5.4 *Accommodation Camp Management*

Environmental management at worker accommodation camps shall involve the same general environmental protection measures as applied at construction sites (where appropriate), plus the following:

- Provision of suitable living accommodation in separate quarters for men and women, free of charge;
- Suitable and adequate toilet and bathroom facilities, also separate for men and women;
- Daily cleaning and replenishment of accommodation and toilets/ bathrooms;
- Provision of a laundry facility;
- Clean and well-equipped kitchen and canteen facilities providing good quality meals for workers;
- Suitable areas set aside for religious worship and recreation.

2.5.5 *Solid and Toxic Waste Management*

The Contractor shall prepare and implement a Solid Waste Management Plan (SWMP) for all sites, which includes but is not limited to the following:

- Specified procedures to reduce waste, applying the hierarchy: Avoid → Minimize → Reuse → Recycle → Treat → Dispose; and enforcing the principle of Reduce, Reuse and Recycle (3 Rs);
- Composting of vegetable waste; separation and recovery of any recyclable materials for which a market exists (e.g. glass, cans, plastic, paper); and disposal of all remaining domestic refuse to a properly managed disposal site (i.e. a landfill with daily covering of the working face with sand or soil);
- Proper storage and disposal of toxic and hazardous waste in accordance with the rules and in consultation with the competent authority and relevant municipalities; this includes oil filters, empty paint cans, etc.;
- Puncture and/or crushing of empty containers of toxic or hazardous materials to prevent them being used for drinking water;
- Appropriate storage and subsequent safe disposal e.g. sale to authorized recycling companies of such materials as: waste lubricating oil; spent vehicle batteries; used vehicle tyres; and wood, paper, glass, cans, plastic, etc.
- No waste is to be burnt.

2.5.6 *Management of Land*

Preparation, use and after-care of land shall include at least the following:

- Conservation of topsoil during vegetation removal, and disposal of cut vegetation by composting to the extent possible, and provision of wood/timber to local communities free of charge;
- Disposal of any remaining vegetation at managed sites, without burning;
- Removal of topsoil before excavation; and storage for future use, with measures to prevent erosion or dust production from stockpiles;
- Prior recording of the location of all walls, fences and other structures on temporarily acquired land, so that they may be replaced at the end of construction;
- Reinstatement of all temporarily acquired land after use to its pre-construction condition or as otherwise reasonably required by the owner;
- Detailed planning of cut and fill volumes to maximize the re-use of material in the project and minimize the disposal of spoil, with excess spoil being deposited at planned disposal sites only;
- Adoption of a precautionary approach towards the risk of uncovering archaeological material, by: a) avoiding any work within the boundaries of scheduled monuments and sites. Work outside the extended boundary as per rules. If required to work within the boundary, necessary permission from authority shall be in place; b) obtaining an expert assessment of the risk of finding material at non-scheduled sites; c) having excavation in high-risk sites observed by qualified archaeologists; d) training workers and digger operatives to recognize archaeological material; and e) halting work if any finds are suspected.

2.5.7 *Transport Management*

The Contractor shall prepare and implement a Transport Management Plan (TMP), which *inter alia*: identifies routes to be used for all significant transportation operations, avoiding settlements and known areas of congestion as much as possible; and incorporates other measures to reduce the environmental and social impacts of protect-related traffic, such as planning deliveries to avoid peak hours, providing diversions where needed, etc. All measures shall be discussed with and approved by relevant highway / road authorities.

Other measures to reduce the impacts of traffic and transportation shall include:

- Ensuring that all vehicles are roadworthy and in a safe and legal condition with respect to all of their systems and comply with national regulations on emissions and noise;
- Ensuring that all drivers have valid license for the class of vehicle they are driving;
- Training all drivers in safe driving and the use of environmentally-responsible techniques, such as switching off engines whenever vehicles are parked;
- Fitting all vehicles with a fire extinguisher and first aid kit;
- Ensuring that all construction vehicles have preferably upward-facing exhaust pipes and audible indicators for reversing;
- Covering loose material when carried on trucks, to prevent dust and losses;
- Prompt cleaning of public roads if affected by spillage of materials.

2.5.8 *Community Liaison and Facilities*

The Contractor shall establish regular contact with communities local to all construction sites for the purposes of exchanging information and developing mutual understanding. Such contacts shall include:

- Consulting all communities in the vicinity of construction sites prior to commencement of any work (via the CLO and other staff as necessary), to inform them of the work proposed, construction programmes, and measures to maintain safety and minimise disruption and disturbance; all such contacts shall be coordinated with the Employer's ongoing programme of community liaison;
- Identification via the consultation process of any important community features, which the Contractor shall make arrangements to conserve or remove/relocate with community agreement, at his own expense;
- Protecting features to be retained (cemeteries, buildings, etc) by secure fences, fluorescent tapes, and appropriate signs;
- Clear marking of excavated areas near settlements with posts, fluorescent tapes and warning signs;
- Providing suitable temporary bridges or diversions wherever existing roads, tracks or footpaths are intersected by construction works;
- Providing temporary potable water supplies if access to the existing water supply is interrupted at any time.
- Barricading of excavated sites near settlement

2.5.9 *Health and Safety*

The Contractor shall develop and implement a Health and Safety Plan (HSP), which provides measures to protect the health and safety of employees at all times when engaged in the construction process and the general public when exposed to construction activities either on- or off-site. This shall include:

- Giving all workers a medical examination (including sight and hearing tests) before being employed and annually thereafter, with records of the examinations kept by the Contractor;
- Providing all employees with verbal and printed information on the health implications of their work and how to avoid problems, with advice on sexually transmitted diseases, including HIV/AIDS;
- Providing regular H&S training to all workers (at least monthly);
- Providing all workers with a set of Personal Protective Equipment (PPE) comprising hard hat and protective boots. Leather gloves, ear defenders, dust mask and with additional safety equipment shall be provided for certain workers as commensurate with the nature of the work they handle (e.g. harnesses when working at height); and adoption of a zero tolerance policy towards any non-usage of PPE;
- Provision of adequate drinking water and clean and suitably equipped toilet and washroom facilities for the number of workers at each site;
- Installation of posts, tapes and warning signs around all excavations;
- Provision of a comprehensive first aid kit and eyewash bottle at all sites, plus a dedicated vehicle to take any injured persons to the nearest hospital if necessary;
- Storage of all legally-used toxic or hazardous materials in locked, waterproof, ventilated enclosures;
- Storage and use of all explosives strictly in accordance with national regulations and international best practice;

- Storage of all compressed gas bottles chained in the upright position in a locked ventilated enclosure, at a location where there is no risk of accidental damage from heavy vehicles or machinery;
- Application of international standards of occupational health and safety to all workplaces.

2.6 Emergency Response Plan

2.6.1 In this section the Contractor shall provide an Emergency Response Plan (ERP) to be applied on all sites to deal with accidents, emergencies and unexpected incidents with attendant environmental risks. This shall identify Most Probable Accidents and specify in succinct terms the action to be taken in each case, including fire, terrorism and other major risks.

2.6.2 The ERP shall include contact details for all local emergency services, hospital/clinic and senior management of the Contractor, Engineer and Employer. It shall include an evacuation plan and route for the site and require practice of emergency procedures at appropriate intervals.

2.7 Training

2.7.1 The Contractor shall describe the training programme and content he will provide for workers and staff in order to:

- Raise awareness of: the role and importance of environmental matters both globally and locally; the potential negative impacts of construction work in general and the ways in which impacts can be mitigated; and the expected construction impacts and long-term environmental and social benefits of the DFC project;
- Disseminate the philosophy and approach of the ESMP to environmental protection throughout the workforce, and explain the roles of all parties in implementing the mitigation and environmental safeguard measures;
- Inform all employees of the mitigation and environmental protection measures they are required to comply with when conducting their work, and the penalties for non-compliance.

2.7.2 Training to raise the awareness and capacity of sub-contractors and their employees shall also be incorporated where necessary.

2.8 Appendices

2.8.1 The ESMP shall contain as appendices the other plans that are components of the mitigation measures specified above and in Clause 6 of the Appendix 2 [SHE Requirements] to the Employer's Requirements.. The contents of the plans shall include, but not be limited to, the items listed:

2.8.2 *Solid Waste Management Plan*

Waste minimization, reuse and recycling; collection/disposal of solid waste from construction sites, accommodation camps and other locations; includes inert construction waste, hazardous materials, domestic and office waste, etc; specifies procedures, equipment, collection timetable, arrangements with municipal authorities.

2.8.3 *Pollution Prevention and Control Plan*

Measures to avoid and minimize pollution of air, water and land by atmospheric and liquid emissions; and measures to detect, contain and clean-up any pollution that may occur; includes operational procedures, monitoring methods, equipment, etc.

2.8.4 *Site Rehabilitation Plan*

Measures to reinstate all temporarily occupied sites after use, including quarries and borrow pits, offices & accommodation camps, waste disposal areas, storage areas, etc; includes removal and disposal of waste, reconstruction of former structures, landscaping, tree planting and such other measures as may reasonably be required by the landowners.

2.8.5 *Site Drainage and Flood Prevention Plan*

Proposals to collect and treat drainage from construction sites and prevent runoff and pollution of surface and groundwater and flooding of surrounding land, with drawings of existing drainage and proposed modifications.

2.8.6 *Health and Safety Plan*

Measures to maintain the health and safety of workers, staff, visitors and safety of the general public on and around all construction sites; covers management, responsibility, procedures, equipment, information and training.

2.8.7 *Accommodation Camp Management Plan*

Proposed approach to: site selection; provision of water, electricity and other basic amenities; accommodation; toilet and washing facilities, sanitation and hygiene; waste disposal; health and safety; and regular maintenance.

2.8.8 *Transport Management Plan*

Proposed approach to minimising the environmental and social impacts of all significant transportation operations, as discussed and agreed with the relevant authorities, including routes to avoid settlements and areas of congestion as much as possible, planning deliveries to avoid peak hours, and such other measures as may be necessary.

2.8.8 *Physical Cultural Resources Plan*

Procedures to ensure the recognition, recording and appropriate protection of any material of archaeological or cultural/historical importance that may be discovered in the course of the construction activities; includes desk study to identify archaeological risk, archaeological watching brief, chance finds procedure, etc.

3. ESMP Implementation

3.1 The Contractor's ESMP shall be implemented within the framework of a company Environmental Management System (EMS), which is certified to ISO 14001-2004, or is scheduled to be so certified within the timescale of this project.

3.2 Each agency sub-contracted by the Contractor shall prepare their own daughter Environmental and Social Management Plans, which follow the format specified in Clause 2 above. This applies to all sub-contractors and major suppliers, whether or not they are working on-site. The Contractor shall provide guidelines on Environment and Social Management to its other vendors viz. transport contractors, waste management contractors, quarry companies, material merchants, fuel suppliers etc. describing how they will manage and minimize the environmental and social impacts of their activities related to this project. The sub-contractor's ESMP should be integrated into the Contractor's ESMP

3.3 The ESMP shall be brought to the attention of all employees engaged in construction or supporting activities, and they shall be given training in those aspects of the ESMP that relate to their work, and an insight into the potential adverse impacts of their work and how they are to be mitigated (Clause 2.7).

3.4 All ESMPs shall be submitted to the Engineer for review and approval at least 60 days before the agency is scheduled to begin work on the project and the Engineer's consent of the same shall be obtained prior to commencement of the work at Site.

ATTACHMENT 2

CONTRACTOR'S ENVIRONMENTAL AND SOCIAL MONITORING PLAN

1. General

1.1 The Contractor shall prepare an Environmental and Social Monitoring Plan (ESMoP) setting out in detail the monitoring he proposes to conduct in order to:

a. Ensure that each environmental mitigation measure that is his responsibility is provided as specified in Section 2.4 of his ESMP (Refer Attachment 1 to Appendix 2);
b. Ensure that each environmental management measure is implemented as proposed in Section 2.5 of his ESMP (Refer Attachment 1 to Appendix 2);
c. Ensure he complies with the requirements of all relevant national and state legislation and any consent conditions applied by government competent authorities;
d. Determine whether each mitigation and management measure is protecting the environment as intended; and
e. Detect any additional environmental impacts that may occur, for which additional mitigation may be needed.

1.2 The Contractor's ESMoP shall be based on the Outline ESMoP submitted with the Bid and shall have the content shown in para 2 herein below (i.e Attachment 2 to Appendix 2) .

1.3 The Contractor shall submit his ESMoP for review by the Engineer within 60 days after the Commencement Date of the Services, and shall amend the ESMoP to address any comments made by the Engineer and submit a Final ESMoP within 14 days of receipt of comments.

1.4 The Final ESMoP shall be binding on the Contractor for the duration of the Services

2. Content of ESMoP

2.1 Monitoring described in the ESMoP shall cover all areas that could be affected by the construction work, including all construction sites and their surroundings, plus off-site areas and locations operated by sub-contractors, such as quarries, transportation routes, waste disposal sites, etc.

2.2 Monitoring shall be conducted at specified regular intervals throughout the entire construction period.

2.3 The Contractor shall be solely responsible for conducting the monitoring described in his ESMoP and for ensuring that data collected are scientifically robust and credible.

2.4 The ESMoP shall describe each monitoring procedure in detail, including (as relevant):

- Purpose;

- Equipment and specifications;
- Calibration procedure;
- Monitoring locations, parameters, frequency and duration;
- Monitoring methodology;
- Data presentation and analysis.

2.5 The monitoring shall include, but not necessarily be limited to, the items listed below

2.6 The most frequent monitoring activity shall involve inspection and observation on a daily basis to determine compliance with the mitigation measures described in Section 2.4 of the Contractor's ESMP (Refer Attachment 1 to Appendix 2).

2.7 Daily inspection and observation shall also be conducted to determine compliance with the management measures specified in Section 2.5 of the Contractor's ESMP (Refer Attachment 1 to Appendix 2), relating to construction site management, accommodation camp management, solid and toxic waste management, management of land, transport management, community liaison and facilities, and health and safety etc..

2.8 The Contractor shall also conduct regular formal monitoring of environmental quality parameters (including air quality, noise and water quality) as proposed by the S-ESIMMS (JICA 2009) to determine the impacts of the ongoing construction work and to record compliance with legally prescribed standards.

2.9 Additional inspection or monitoring shall be conducted as may be specified by government competent authorities in consent conditions or other approvals obtained by the Contractor.

2.10 Additional "spot" monitoring shall be conducted whenever non-compliance is observed, or if a complaint is received from a member of the public, organisation or a government body.

3. ESMoP Implementation

3.1 Monitoring activities shall be conducted by the Contractor's employees, or specialist sub-contractors employed by him; and all persons involved in the monitoring procedures shall be suitably qualified and experienced. Engineer's representative may also join if he so desires

3.2 Monitoring at each construction site shall planned and supervised by the Contractor's Senior Environment Officer at that site, and overall implementation of the ESMoP across all sites shall be planned and coordinated by the Contractor's Chief Environmental Officer.

3.3 The results of the monitoring shall be regularly reported to the Engineer and Employer as specified in Clause 6.13 of Appendix 2 [SHE Requirements] to the Employer's Requirements.

ATTACHMENT 3

Safety, Welfare and Occupational Health Requirements

Safety, Welfare and Occupational Health requirements as per BOCW Act 1996 and BOCW Rules 1998

(This list has been prepared in chronological order with primary importance to Section of Act and secondary importance to Rules)

S - Refers relevant Sections in BOCWA
R - Refers relevant Rules in BOCWR
C - Refers relevant Chapter No. in BOCWR

Sl. No.	Items / Requirements	Relevant Sections / Rules in BOCWA and BOCWR
1.	Registration of establishment	S – 7, R – 23 to 27
2.	Display of registration certification at workplace	R – 26 (5)
3.	Hours of work	S – 28 R – 234 to 237
4.	Register of overtime	S – 28; S – 29 R – 241(1) Form XXII
5.	Weekly rest and payment at rest	R – 235
6.	Night shift	R – 236
7.	Maintenance of workers registers and records	S – 30 R – 238
8.	Notice of commencement and completion	S – 46 R – 239
9.	Register of persons employed as building workers	R – 240
10.	Muster roll and wages register	R – 241(1) (a); Form XVI and XVII
11.	Payment of wages	R – 248
12.	Display of notice of wages regarding	R – 249
13.	Register of damage or loss	R – 241(1)(a); Form XIX, XX, XXI
14.	Issue of wages book	R – 241(2)(a); Form XXIII
15.	Service certificate for each workers	R – 241(2)(b); Form XXIV
16.	Display an abstract of BOCWA and BOCWR	R – 241(5)
17.	Annual return	R – 242; Form XXV
18.	Drinking water	S – 32
19.	Latrines and Urinals	S – 33

		R - 243
20.	Accommodation	S – 34
21.	Creches	S – 35
22.	First-aid boxes	S – 36 R – 231 and Schedule III
23.	Canteens	S – 37; R – 244
24.	Food stuff and other items served in the canteens	R – 245
25.	Supply of tea and snacks in work place	R – 246
26.	Food charges on no loss no profit basis	R - 247
27.	Safety committee	S – 38 R – 208
28.	Safety officer	S – 38 R – 209 and Schedule VII
29.	Reporting of accidents and dangerous occurrences	S – 39 R – 210
30.	Procedure for inquiry in to the causes of accidents	R – 211
31.	Responsibility of employer	S – 44; R – 5
32.	Responsibility of Architects, Project Engineer and Designers	R – 6
33.	Responsibility of workmen	R – 8
34.	Responsibility for payment of wages and compensation	S – 45
35.	Penalties and Procedures	S – 47; S – 55
36.	Excessive noise, vibration etc	R – 34
37.	Fire Protection	R – 35
38.	Emergency action plan	R – 36
39.	Fencing of motors	R – 37
40.	Lifting of carrying of excessive weight	R – 38
41.	Health, Safety and Environmental Policy	R – 39
42.	Dangerous and Harmful Environment	R – 40
43.	Overhead protection	R – 41
44.	Slipping, Tripping, Cutting, Drowning AND Falling Hazards	R – 42
45.	Dust, Gases, Fumes, etc	R – 43
46.	Corrosive substance	R – 49
47.	Eye Protection	R – 45
48.	Head Protection and other protection apparel	R – 46; R – 54
49.	Electrical Hazards	R – 47
50.	Vehicular traffic	R – 48
51.	Stability of structure	R – 49

52.	Illumination	R – 50; R – 124
53.	Stacking of materials	R – 51
54.	Disposal of debris	R – 52
55.	Numbering and marking of floors	R – 53
56.	Lifting appliances and gears	C – VII; R – 55 to 81
57.	Runways and Ramps	C – VIII; R – 82 to 85
58.	Working on or adjacent to water	C – IX; R – 86 & 87
59.	Transport and earthmoving equipments	C – X; R – 88 to 95
60.	Concrete work	C – XI; R – 96 to 107
61.	Demolition	C – XII; R – 108 to 118
62.	Excavation and Tunnelling works	C – XIII; R – 119 to 168
63.	Ventilation	R – 153
64.	Construction, repair and maintenance of step roof	C – XIV; R – 169 to 171
65.	Ladders and Step ladders	C – XV; R – 172 to 174
66.	Catch platform and hoardings, chutes, safety belts and nets	C – XVI; R – 175 to 180
67.	Structural frame and formworks	C – XVII; R – 181 to 185
68.	Stacking and unstacking	C – XVIII; R – 186 & 187
69.	Scaffold	C – XIX; R – 188 to 205
70.	Cofferdams and Caissons	C – XX; R – 206 to 211
71.	Explosives	C – XXI; R – 212 & 213
72.	Piling	C – XXII; R – 214 to 222
73.	Medical Examination for building and other construction worker, Crane operator an Transport vehicle drivers	R – 81; R – 223(a)(iii) and Schedule XII
74.	Medical examination for occupational health hazards	R – 233(a)(iv)
75.	Charging of workers for Medical Examination	R – 223(b)
76.	Occupational health centres and Medical officers	R – 225 and Schedule X & XI
77.	Ambulance van & room	R – 226 & 227 and Schedule IV & V
78.	Stretchers	R – 228
79.	Occupational health service for building workers	R – 229
80.	Medical examination for occupational health hazards	R – 223(a)(iv)
81.	Emergency care services & emergency treatment	R – 232
82.	Panel of experts and agencies	Central Rule 250
83.	Power of inspectors	Central Rule 251

ATTACHMENT 4

Contents of SHE Plan

SITE SHE PLAN	
Contract No.	
Contractor Name	
Project Name	

1	**Project Highlights** i. Title of the content ii. Contractor Number iii. Brief scope of work iv. Location map/ key plan v. Period of the project
2	**SHE Policy**
3	**Site Organization Chart** Chart indicating reporting of SHE personnel
4	**Roles & Responsibility** Individual responsibility of the i. Contractor's Representative ii. SHE Director iii. Chief Environmental Officer iv. Chief Accident Prevention Officer v. Construction Manager vi. Construction Supervisors vii. SHE Committee Members viii. SHE Incharge ix. Site Engineers x. First Line Supervisors xi. Sub-contractors
5	**SHE Committee** i. Details - Chairman, Members, Secretary and Engineer ii. Procedures for effective conduct of meeting
6	**SHE Training**
7	**Sub-contractor Evaluation, Selection and Control**
8	**SHE Inspection**
9	**SHE Audit**
10	**Accident Investigation And Reporting Procedures**
11	**Occupational Health Measures**

12	**Labour Welfare Measures**
13	**Risk Assessment and Mitigation Procedures**
14	**Safe Work Procedures** i. Work at Height ii. Structural Steel Erection iii. Launching of segments iv. Embankments and Cuttings v. Switch-over works vi. Bridges, ROBs, RUBs, Railway Flyovers vii. Works in close vicinity of railway tracks/ roads viii. Floor, Wall Openings and Stairways ix. Welding, Cutting and Bracing x. Lifting appliances xi. Work Permit Systems xii. Electrical Equipments xiii. Mechanical Equipments xiv. Excavation xv. Fire Prevention xvi. Hazardous Chemicals and Solvents xvii. Ionising Radiation xviii. Lighting xix. Abrasive Blasting
15	**Work Permit System**
16	**List of standard job specific PPEs to be used in the site**
17	**Maintenance of Regime for construction Equipment and Machinery**
18	**Traffic Management**
19	**Housekeeping**
20	**Environmental Management**
21	**Emergency Management**
22	**Visitors and Security arrangement**

Note: The Environmental and Social Management Plan (ESMP), the Environmental and Social Monitoring Plan (ESMoP), the Safety Plan and Programme (SP&P) and the Safety Monitoring Plan (SMoP) which supplement the conventional SHE Plan shall be incorporated in the relevant sections.

ATTACHMENT 5

Work Place Policy

DFCCIL's
WORKPLACE POLICY ON HIV/AIDS PREVENTION & CONTROL
FOR WORKERS ENGAGED BY CONTRACTORS

1.0 Background and Rationale

DFCCIL recognizes that the continuing spread of HIV/AIDS constitutes a serious obstacle to the process of development and realizes that there is a need to have coordinated and sustained response to the HIV/AIDS epidemic.

DFCCIL recognizes that access to medication in the context of pandemics such as HIV/AIDS is one of the fundamental elements necessary to achieve progressively the full realization of the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.

DFCCIL recognizes that care, support and treatment can contribute to effective prevention through increased acceptance of voluntary and confidential counseling and testing, and by keeping people living with HIV/AIDS and vulnerable groups in close contact with health-care systems and facilitating their access to information, counseling and preventative supplies.

DFCCIL recognizes that effective prevention, care and treatment strategies will require behavioral changes and increased availability of and non-discriminatory access to, inter alia, vaccines, condoms, microbiocides, sterile injecting equipment, drugs including anti-retroviral therapy, diagnostics and related technologies as well as increased research and development;

2.0 General

2.1 The transmission of the Human Immuno-deficiency Virus (HIV) is through:

- Unprotected sexual contact with an infected person;
- Transfusion of infected blood or blood products;
- Sharing of infected needles or syringes; and
- From infected m other-to-child during pregnancy, childbirth or breast feeding.

2.2 There is no scientific or epidemiological evidence to suggest that HIV can be transmitted through ordinary workplace contact (talking to or touching the person, using the same office equipment, tools, utensils or bathroom). Transmission is therefore not likely in the regular workplace setting.

2.3 People with HIV may remain healthy and fit to work for several years despite their infection.

2.4 With the availability of Anti Retroviral Treatment, the life of people living with HIV can be prolonged substantially and they can lead a normal productive life.

3.0 Aim

The policy aims to:

- Prevent transmission of HIV infection amongst workers engaged by the Contractor including those of his subcontractors and consultants and their families;
- Provide access to care, support and treatment to those who are infected;
- Protect workers from stigma and discrimination related to HIV/AIDS by assuring them equity and dignity at the workplace;

4.0 Scope

This policy applies to all contractors, subcontractors, consultants and their employees (including applicants applying them for work) in the work sites, office locations, accommodation camps, all other workplaces and contracts of employment, and all aspects of work, formal and informal and the self-employed worker engaged with the Contractor for providing goods or services at any work location and their spouse and children or other family members, residing with the worker.

5.0 Guiding Principles

5.1 The policy adopts the key principles of the International Labour Organization (ILO) 'Code of Practice on HIV/AIDS and the World of Work' that are in line with the Government of India's 'National HIV/AIDS Policy' and approach of Japan International Cooperation Agency (JICA).

5.2 Based on above, the Contractor shall:

a) Provide a safe and healthy work environment for employees;
b) Educate its employees and their family members on prevention, care and treatment of HIV/AIDS;
c) Provide counselling service;
d) Educate its employees on safe blood donation and transfusion;
e) Maintain confidentiality with regard to the identity and medical information of an infected employee. Only the immediate senior would be kept advised to prevent any medical eventuality;
f) Allow an HIV positive employee to continue to work in his or her job unless medical conditions interfere with the job requirement. On health grounds, the employee may be shifted to an other job for which he is medically fit;
g) Ensure continued employment and benefits to people living with HIV (PLHIV);
h) Ensure that the co–employees do not shun their HIV positive peer or refuse to work alongside them;
i) Not discriminate against any employee infected by HIV/AIDS with regard to promotions, training and any other privileges, applicable to all employees of his organization;
j) Not ask any person who is being offered a job to undergo HIV/AIDS prevalence test, without an informed consent and pre-test counseling of the candidate, as a part of general medical examination before the issue of the appointment letter, or otherwise;
k) Educate its employees and encourage them to participate in voluntary counseling and testing of HIV/AIDS. However, HIV/AIDS tests shall not be a part of any annual or regular health check ups, without the employee's informed consent and pre test counseling.
l) Ensure that proper treatment is available to employees infected with HIV/AIDS and prescribe a reasonable limit on expenditure in meeting the cost of anti-retroviral (ARV) drugs. All other costs related to treatment of HIV/AIDS (non-ARV) shall be borne by the Contractor.
m) Empanel appropriate hospital(s) for treatment of HIV/AIDS of an infected employee and release payment directly to such hospital.

6.0 Action Plan

6.1 The Contractor shall engage a professional agency (PA), with approval of the Engineer, to facilitate implementation of the guidelines laid down in this policy by the Contractor.

6.2 The Contractor shall undertake measures to reduce the risk of the transfer of HIV virus between and among the Contractor's employees including those engaged by his subcontractors and the local community, to promote early diagnosis and to assist the affected individuals.

6.3 The Contractor shall conduct Information, Education and Communication (IEC) campaigns via, the appointed professional agency, once in every month, addressed to all employees

including the employees of subcontractors and consultants, all truck drivers, helpers, crew making material deliveries at the site and the local communities. The IEC campaign shall focus on risks, dangers, impact, and avoidance behavior in respect of:

a) Sexually transmitted diseases (STD);
b) Sexually transmitted infections (STI);
c) HIV/AIDS

6.3.1 The IEC campaign shall include distribution of informative leaflets, screening of educative films, display of posters and banners, small group lectures, street plays etc.

6.4 The Contractor shall identify peer educators (one for every one hundred workers) from among his employees and refer them for professional training to the appointed professional agency.

6.4.1 The peer educators on completion of the training shall serve as the focal point for any information, education and awareness campaigns among the workers throughout the contract period.

6.4.2 The peer educators shall be paid a monthly honorarium as fixed by the Contractor for rendering these services in addition to their regular duties.

6.4.3 The total number of peer educators (1 for 100 workers) shall always be maintained by the Contractor.

6.4.4 If a peer educator leaves the Contractor's employment, then the Contractor at his own expense shall train the new replacement peer educator via the Engineer/ Employers' appointed agency for the purpose.

6.5 The Contractor shall establish on-site health clinics to provide free of charge counseling and information on STI/HIV/AIDS, and first-aid services.

6.5.1 The Contractor shall provide facility for STI and HIV/AIDS screening, diagnosis, and referral to a dedicated national STI and HIV/AIDS programme in such clinics.

6.5.2 The Contractor shall arrange for health checks including HIV/AIDS screening before work begins and annually thereafter.

6.6 The Contractor shall arrange for free supply of condoms at accommodation camps.

6.7 The Contractor shall submit, as a part of the Project SHE Plan, a comprehensive action plan listing the activities to be undertaken regarding prevention of STI and HIV/AIDS, within 42 (forty two) days of award of the contract, for approval of the Engineer.

6.8 The action plan shall contain various activities to be undertaken by the Contractor during the period of contract as mentioned in this policy and specified in the contract.

7.0 Implementing Organization

7.1 A Joint Coordination Committee (JCC) shall be constituted by the Employer in respect of the contracts awarded by the DFCCIL where this policy is required to be implemented.

7.1.1 The JCC shall monitor the implementation of the Employer's workplace policy on HIV/AIDS prevention and control for employees engaged by the Contractors.

7.1.2 The JCC shall consist of the representatives of:

a) Employer;
b) Project Management Unit (PMU);
c) Professional Agency appointed by the Employer;
d) Contractors;
e) State Aids Control Society (SACS);
f) State Health Department;
g) A Subject matter specialist;
h) Any other member as may be decided by the Employer.

The chairman of the JCC shall be nominated by the Employer.

7.2 A project coordination committee (PCC) shall be constituted by the JCC in respect of each contract awarded by the DFCCIL where this policy is required to be implemented. The PCC shall consist of the following members:

a) the Engineer
b) the Contractor
c) Representative of the professional agency appointed by the Employer;
d) Representative of SACS/Local Health Department of the state;
e) Representative of Workers;

7.2.1 The PCC shall monitor the implementation of the Employer's workplace policy on HIV/AIDS prevention and control for employees engaged by the Contractors at the project level.

8.0 Role of Key Stakeholders

The following shall be the role of the key stake holders with regard to implementation of this policy:

Key Stakeholder	Role
JCC	The JCC shall: a) Examine the action plan submitted by the Contractor under this policy or the contract and recommend the same for approval of Employer; b) Monitor and evaluate the progress of activities, budget utilization etc. under this policy or the contract; c) Discuss and advise on major issues that arise during implementation; d) Conduct periodic review and take remedial steps, if required; e) Give periodic progress reports to the Employer. The JCC shall meet once in six months or whenever the necessity arises.
PCC	The PCC shall: a) Provide guidance for implementation of the action plan approved by the Employer; b) Monitor and review the activities being undertaken including resource utilization; c) Advise on problems being faced by the Contractor during implementation; d) Give periodic progress report to the Engineer and JCC. The PCC shall meet once in two months or whenever necessity arises.
PMU	The PMU shall designate an HIV/AIDS division to work closely with expert(s) and the professional agency.
The Engineer	The Engineer shall: a) Formulate, in consultation with the Employer, the project specific HIV/AIDS prevention programme; b) Approve the contract specific HIV/AIDS prevention programme submitted by the Contractor; c) Approve the Terms of Reference (TOR) submitted by the Contractor for hiring the professional agency (PA);

	d) Assist PMU in establishing and strengthening HIV/AIDS division; e) Coordinate with other stakeholders to modify or revise the action plan as and when required, and explain the JCC for its clearance during its meetings; f) Supervise the programme implementation; g) Monitor, evaluate and report the implementation progress; h) Appoint an independent consultant to undertake mid-term and concurrent evaluation; i) Supervise Contractor's obligation under this policy or the contract for prevention and control of HIV/AIDS.
Contractors	The Contractor shall: a) Submit to the Engineer for his approval, the contract specific detailed HIV/AIDS prevention programme; b) Submit to the Engineer for his approval, the Terms of Reference (TOR) for hiring the professional agency (PA); c) Engage a professional agency with approval of the Engineer; d) Work with the professional agency (PA) in implementing HIV/AIDS prevention programme among his employees including the employees of his subcontractors and consultants. e) Establish on-site health clinics to provide the following without any charge, to his employees and their families: • Information and counseling on STI/HIV/AIDS; • First-aid services on universal precaution for HIV/AIDS prevention; • Screening and diagnosis facility; • Referral facility to a national programme; • Supply of contraceptive devices to males/ females, including condoms. f) Ensure participation of his employees and employees of his subcontractors and consultants including self-employed or piece rated employees, in the HIV/AIDS prevention programme in the course of their employment and during normal working hours; g) Do nothing to dissuade the employees as mentioned in (f) above from participating in HIV/AIDS prevention programme; h) Encourage employees to work as peer educators on HIV/AIDS prevention after being trained by the professional agency (PA); i) Ensure active participation of his occupational health staff in implementing the key tasks organized by the professional agency (PA); j) Arrange distribution of contraceptive devices including condoms in the employee accommodation camps without any charge; k) Arrange distribution of IEC materials among the employees and their family members prepared through the professional agency (PA); l) Establish linkage with SACS and/or local health authorities for their help, guidance and integration with the national programme; m) Facilitate monitoring activities and undertake supervision to ensure that the programme is implemented as planned; n) Convene monthly meeting with the professional agency (PA) for updates on progress of the programme;

	o) Report progress to the Engineer and PCC on a monthly basis

The contractor is expected to apply the above concepts to promote the same in a positive and proactive manner during the execution of its contract.

ATTACHMENT 6

Work Place Policy on Labour Protection

DFCCIL's
WORKPLACE POLICY ON LABOUR PROTECTION

CHAPTER - I
Perspectives

1.0 Preamble

DFCCIL believes that all its employees including the employees of contractors, subcontractors or consultants must live with social and economic dignity and freedom, regardless of nationality, gender, race, economic status or religion.

Further, DFCCIL is committed to the principles of:

a) No child or forced labour in its operations.
b) Discrimination free workplace.
c) Gender Equity.
d) Supportive work environment.

DFCCIL intends to evolve a workplace policy on labour protection for the employees and workers of contractors, subcontractors and consultants upholding the rights of citizens enshrined in The Constitution of India, principles laid down in the Directive Principles of State Policy and the statutory provisions contained under applicable laws relating to employment and service conditions of labour, their welfare, occupational health and safety.

2.0 Aim

The policy aims to:

a) Provide a statutory framework on employment and service conditions of labour, their welfare, occupational health and safety.
b) Design suitable control systems of compliance, enforcement and incentives for better compliance;
c) Provide administrative and technical support services;
d) Provide a system of incentives to contractors and their employees to achieve higher health and safety standards;
e) Provide for a system of non-financial incentives for improvement in safety and health;
f) Provide for a system of penalties if provisions on safety, health and employee welfare are not adhered to.

3.0 Objectives

The basic objectives of this Workplace Policy on Labour Protection are:

a) To promote a just, free and humane workplace ambience;
b) To ensure safe and healthy working conditions;
c) To eliminate the incidence of work related injuries, diseases, fatalities, disaster and loss of national resources;
d) To ensure a high level of occupational health and safety and conditions of labour through proactive approaches including a system of penalties and awards;
e) To enhance the well-being of the employees and their family members.

4.0 Scope

This policy applies to all contractors, subcontractors, consultants and their employees (including candidates applying to them for work) in the work sites, office locations,

accommodation camps, all other workplaces and contracts of employment, and all aspects of work, formal and informal and the self-employed worker engaged with the contractor for providing goods or services at any work location and their spouse and children or other family members, residing in contractor provided accommodation with the worker.

5.0 Framework

This policy and guidelines of action plan is based on the framework as given below:

5.1 Laws and Regulations:

The Contractor shall fully comply with the applicable labour laws as amended from time to time and the rules framed there-under as given in Appendix -3 [SHE Requirements] of the Employer's Requirements of the Bid Documents and this policy.

5.2 Policy and Manual for Health and Safety:

The Contractor shall promote safe and healthy working practices and adhere to the norms given in the project Safety, Health and Environment (SHE) requirements notified in the Bid Document.

5.3 Contractor's Policy and plan for Health and Safety:

The Contractor shall submit policy and plan for health and safety which shall include the stipulations made in the aforesaid Appendix-3 [SHE Requirements] of the Employer's Requirements.

5.4 Design and Method Statement:

The Contractor shall prepare the method statements for construction based on the design that shall include measures and methods for dealing with the risks in construction within the period stipulated in the Bid Documents.

5.5 Health and Safety on Site:

The Contractor shall develop the regulations for safety and health committee to be established in terms of the requirements given in aforesaid Appendix-3 [SHE Requirements] of the Employer's Requirements.

The Contractor shall also develop the regulation for the site inspection and monitoring compliance of health and safety norms.

5.6 Prevention and Control of HIV/AIDS:

The Contractor shall prepare a manual for HIV/AIDS prevention and control for his workers in terms of the Employer's policy and submit the same for Employer's approval within the period stipulated in the aforesaid Appendix 2[SHE Requirements] of the Employer's Requirements.

6.0 Coverage

6.1 The coverage of this policy shall be as under:

a) Conditions of employment;
b) Salary and Wages;
c) Social Security;
d) Occupational Health and Welfare;
e) Compliance with Labour Laws;
f) Implementation and monitoring.

7.0 Awareness

7.1 The Contractor shall create awareness about this policy by:

a) Wide circulation among his key officials, subcontractors and consultants;
b) Display in notice boards at conspicuous places;
c) Increasing awareness on safety, health and environment at the workplace through appropriate means;

d) Providing forums for consultations with employees representatives on matters relating to occupational safety, health and welfare and wherever necessary with the community on matters of societal concerns with the objective of increasing productivity;

e) Encouraging joint labour-management efforts to preserve, protect and promote national assets and to eliminate injuries and diseases arising out of employment;

f) Providing medical criteria wherever necessary to ensure as far as is reasonably practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work place activities and that in the event of such occupational diseases having been contracted, the affected employee is suitably compensated;

g) Taking necessary steps to provide safe and healthy working conditions and ensure that workers and their representatives are consulted, trained, informed and involved in all measures related to their safety and health at work;

8.0 Occupational safety and health skills development

8.1 The Contractor shall:

a) Arrange training programmes to increase the number and competence of personnel engaged in the field of occupational safety and health and environment at workplace;

b) Provide information and advice, in an appropriate manner, to employees with a view to eliminating hazards or reducing them as far as is reasonably practicable;

c) Establish occupational health services aimed at protection and promotion of health of employee and improvement of working conditions and by providing employee access to these services.

d) Integrate health and safety into vocational, professional and labour related training programmes including management development programmes;

e) Adopt Occupational Safety and Health training curricula in workplace programmes.

9.0 Miscellaneous

9.1 The Contractor shall comply with the applicable labour laws and the rules framed there under by Central or State Government as amended and/or modified from time to time.

9.2 Consequences and or penalties arising out of violation of the applicable laws shall be the sole responsibility of contractors.

9.3 The policy shall also be periodically reviewed by the Employer with reference to the evolving legislation, scope and programme of the work, ambient conditions, etc. and the Contractor shall incorporate the requisite modifications in execution of the work without any extra charges.

10.0 Conclusion

There is a need to develop close involvement of social partners to meet the challenges ahead in the assessment and control of workplace risks by mobilising local resources and extending protection to such working population and vulnerable groups where social protection is not adequate.

DFCCIL stands committed to strengthen the labour protection mechanism through broad-based consultation, develop special programmes for hazardous operations, set up training mechanisms, create awareness, arrange for the mobilisation of available resources and expertise.

This policy envisages total commitment and demonstration by all concerned stake holders through dedicated and concerted efforts consistent with the requirements of labour protection at workplace and thereby improving the quality of work and working life.

The policy shall be periodically reviewed by the Employer with reference to the evolving legislation, scope and programme of the work, ambient conditions, etc. and the Contractor

shall incorporate the requisite modifications in execution of the work without any extra charges.

CHAPTER-II
CONDITIONS OF EMPLOYMENT

1.0 The Contractor shall engage appropriate staff and labour, local or otherwise to enable him to completely fulfil all his obligations under the contract.

1.1 The Contractor shall devise or should already have service rules defining the conditions of employment of the staff and workers employed by them in the project of DFCCIL.

1.2 The service rules shall contain the following provisions:

a) Classification of workers, e.g., whether permanent, temporary, apprentices, probationers, substitute or casual.

b) Intimation of periods and hours of work, holidays, paydays and wage rates to the workmen.

c) Shift working.

d) Attendance and late coming.

e) Procedure for applying for grant of leaves and holidays, specifying the sanctioning authority and conditions thereof.

f) Requirement to enter premises by certain gates, and liability to search.

g) Closing and reopening of sections of the industrial establishment, and temporary stoppages of work and the rights and liabilities of the Employer and workmen arising there-from.

h) Termination of employment, and the notice thereof to be given by Employer and workers.

i) Suspension or dismissal for misconduct, and acts or omissions which constitute misconduct.

j) Means of redress available to workers against unfair treatment or wrongful exactions by their employer or his agents or servants.

1.4 The conditions of employment to be contained in the above mentioned service rules shall not be inferior to the provisions contained in the model standing orders given as Schedule-I of Industrial Employment (Standing Orders) Central Rules, 1946.

1.5 The Contractors shall get the above said rules known as standing orders certified under the Industrial Employment (Standing Orders) Act, 1946, or should already have got certified by the certifying officer under this Act, if the number of workmen employed by them is 100 or more. The appropriate Government for the purpose of this act is the government of the State in which the project work is being carried out by the concerned contractor.

1.6 The Contractor shall give 'Notice of discontinuance or re-starting of a shift working' in the prescribed format given in the rules framed by the concerned State Government under the Act.

1.7 The Contractor shall give a notice to the workers in respect of any change in the conditions of employment and he can not effect such change within 21 days of giving such notice as required under section-9 of Industrial Disputes Act, 1947.

1.8 Any cessation of employment like lay-off or retrenchment shall be resorted to complying with the conditions stipulated in Industrial Disputes Act, 1947.

1.9 No contractor or any worker or any trade union whether registered under the Trade Unions Act, 1926 or not, shall commit any unfair labour practice given in the Fifth Schedule of Industrial Disputes Act, 1947.

1.10 Any dispute arising out of terms and conditions of employment or non-employment, between the Contractor and his workers, two or more contractors or among the workers shall be resolved in accordance with the provisions contained in the Industrial Disputes Act, 1947.

2.0 The Contractor shall ensure that no discrimination is made against women at the time of recruitment or in any condition of service subsequent to recruitment such as promotion, training or transfer.

3.0 The Contractor shall not allow or require a woman to work between 6 pm and 7 am.

4.0 The Contractor shall comply with the provisions contained in The Child Labour (Prohibition and Regulation) Act, 1986 and shall not employ any child. The appropriate government is State Government for this purpose.

5.0 **The Contractor will protect the right of the workers to form trade unions in accordance with the provisions contained in The Trade Unions Act, 1926.**

CHAPTER-III
Salary and Wages

1.0 Payment of salary and Wages

The Contractor shall make payment of salary and wages to his employees on or before seventh day of the following month. However, payment to workers engaged on daily basis, casual workers, and piece-rated workers may be released on or before seventh day after the wage period.

1.1 Permissible Deductions

The deductions on account of the following from the wages are the permissible as per the Payment of Wages Act, 1936:

a) Absence of duty and fines if any;
b) House accommodation if provided;
c) Recovery of advance and loans given;
d) Income tax, Provident fund, ESI contribution, and LIC premium,
e) Amenities provided.

Deduction by order of Court etc. is permitted. Maximum deduction can be 50%. However, maximum deduction up to 75% is permissible if deduction is partly made for payment to cooperative society.

1.2 Documentation

The Contractor shall maintain following registers/documents:

a) Salary registers.
b) Attendance registers.
c) Advance register.
d) Deduction registers.
e) Over time register.
f) Fine Registers.
g) Wage Slips.

2.0 Minimum Wages

The Contractor shall pay fair wages to his employees keeping in view the best practices and industry standards. It must be ensured that workers in various categories are paid not less than the minimum wages fixed and notified by the Central / State Government as applicable.

2.1 Documentation

2.1.1 The Contractor shall maintain documents and records as per the rules including the following:

a) muster roll in Form VII;

b) Registers in respect of Advance, Deduction, Over Time and Fines;

c) Wage slips;

d) Display of Form X Abstract;

e) Display of Minimum Wages.

2.1.2 The Contractor shall ensure submission of Annual Return, to the Regional Labour Commissioner (Central) before 31st of January.

3.0 Bonus

The Contractor shall pay bonus in an accounting year to his employees drawing salary not exceeding rupees ten thousand per month, in accordance with the provision of the Payment of Bonus Act, 1965.

3.1 The Contractor shall be bound to pay a minimum bonus of 8.33 per cent of the salary or wages earned by an employee during the accounting year and the maximum bonus would be 20 per cent. The amount of bonus payable to the employees shall be calculated in a manner as given in the Payment of Bonus Act, 1965, as amended from time to time.

3.2 If the salary or wages of an employee exceeds rupees three thousand five hundred, bonus shall be calculated as if his salary or wages were rupees three thousand five hundred per month.

3.3 Every employee shall be entitled to be paid bonus in an accounting year, in accordance with the provisions of this Act, provided he has worked in the establishment for not less than thirty working days in that year.

3.4 The Contractor shall ensure submission/maintenance of records as required under the Act and rules:

a) Preparation & Maintenance of Form A, Form B and Form C (Registers);

b) Submission of Annual Return in Form D before 30th November.

3.5 The appropriate government for the purpose of this Act is the Central Government.

4.0 Equal Pay for Equal Work

4.1 The Contractor shall comply with the provisions contained under the Equal Remuneration Act, 1976 and ensure payment of equal remuneration to men and women workers performing the same or similar work.

CHAPTER-IV
SOCIAL SECURITY

1.0 Provident Fund

i) The Contractor shall cover his employees under the Employees Provident Fund and Miscellaneous Provisions Act, 1952 via independent code numbers allotted to him by the Central Provident Fund Organisation, prior to his participation in the bidding process.

ii) The Contractor shall ensure compliance to the above Act including the following:

a) Calculation of provident fund liability & preparation of monthly provident fund Statement;

b) Preparation of provident fund challan in quadruplicate;

c) Submission of PF Challan before 15th of every month along with the cheque to the authorized bank and obtaining the acknowledgement;

d) Obtaining the Triplicate and Quadruplicate Bank clearance Challan;

e) Obtaining Form.No-2 from new entrants joined during the month;

f) Maintenance of Provident Fund Register on monthly basis;

g) Preparation & Submission of Form 12-A on monthly basis;

h) Submission of PF Nomination forms for every new employee on monthly basis;

i) Preparation & Submission of Form-12A, Form-5 & Form-10 and Form.No-2 along with the triplicate copy of the Challan to PF Department before 15th/25th of the Month;

j) Maintaining Form -11;

k) Processing of Form 13 and submission to Central Provident Fund Organisation;

l) Processing of Form 20,10D and Form 5(IF) in respect of death claims.

m) Preparation & submission of Form-9;

n) Submission of withdrawal forms and doing follow-up till it gets settled;

o) Correspondence with provident fund authorities whenever required;

p) Attend periodical inspections by provident fund officers and comply their observations;

q) Preparation & Submission of Annual Return in Form No 3A & 6A every year;

r) Maintenance of Inspection book;

s) Processing of FomNo.31, if required;

t) Follow-up and obtaining Form.No-23 (annual account slips) from the Central Provident Fund Organisation.

2.0 Employees State Insurance

i) The Contractor shall cover his employees under the Employees State Insurance Act, 1948 via independent code numbers allotted to him by the Employees State Insurance Corporation, prior to his participation in the bidding process.

ii) The Act applies to factories. The Act will apply to any process of construction which comes within the definition of factory as contained under The Factories Act, 1948 as amended from time to time. For example, the workshops and production centre are covered under The Factories Act, 1948.

iii) The Act does not apply to construction workers. However the following employees are covered:

a) Those who are employed in the administrative offices if their number is 20 or more;

b) Those who work in the factories owned by the Contractor and subcontractors, undertaking turnkey execution of works;

c) Those who are earlier covered under the Act and are deployed/deputed in the project;

d) Staff deployed in canteen.

iv) It is advised that the Contractor should explore the possibility of covering all the employees under this Act if the ESI hospital facility is available in the vicinity of work sites. This will ensure better health facility for the employees besides facilitating smooth administration of the benefit. Alternatively, the contractor can provide better benefits than those available under the Act to the covered employees and seek exemption from the operation of the Act.

v) In respect of the employees covered under the Act, the Contractor shall ensure documentation as per the Act including the following:

a) Calculation of ESI liability & Preparation of ESI Monthly Statement;

b) Preparation of ESI Challan in Quadruplicate;

c) Submission of ESI challans before 21st of every month along with the payment authorization to the authorized bank and obtaining the acknowledgement;

d) Obtaining the Triplicate and Quadruplicate bank clearance Challan;

e) Maintenance of Form-7 (registers);

f) Obtaining Form.No-1 from new entrants and submission along with Form.No-3 to the ESI Local Office within 10days from the date of the appointment;

g) Collecting ESI Temporary and Permanent cards from ESI Branch office;

h) Submission of Accident reports in Form-16 to ESI Dispensaries/ESI Branch Office;

i) Maintenance of Accident Registers;

j) Maintenance of Inspection Book;

k) Processing of claims forms for Funeral Expenses;

l) Maintenance of ESI Register on monthly basis;

m) Correspondence with ESI Authorities whenever required;

n) Attend periodical Inspections by ESI Authorities and comply with statutory requirements;

o) Preparation and Submission of ESI Half yearly return before 12th May and 11th November of each year;

p) Processing of Forms prescribed under the Act;

q) Submission of annual return before 31st of January.

3.0 Gratuity

i) The Contractor shall ensure payment of gratuity to the eligible employees in accordance with the provisions contained in The Gratuity Act, 1972.

ii) Gratuity is payable to a person on (a) resignation (b) termination on account of death or disablement due to accident or disease (c) retirement (d) death. Normally, gratuity is payable only after an employee completes five years of continuous service. In case of death and disablement, the condition of minimum 5 years' service is not applicable.

iii) Gratuity is payable @ 15 days salary/wages for every year of completed service. In the last year of service, if the employee has completed more than 6 months, it will be treated as full year for purpose of gratuity.

iv) In case of employees paid on monthly salary/wages basis, per day wages should be calculated by dividing monthly salary by 26 days to arrive at daily wages e.g. if last

drawn salary of a person (basic plus DA) is Rs. 2,600 per month, his salary per day will be Rs. 100 (2,600 divided by 26). Thus, the employee is entitled to get Rs. 1,500 [15 days multiplied by Rs. 100 daily salary] for every year of completed service. If he has completed 30 years of service, he is entitled to get gratuity of Rs. 45,000 (Rs. 1,500 multiplied by 30). Maximum gratuity payable under the Act is Rs. 10 lakhs.

v) The Contractor shall obtain an insurance from the Life Insurance Corporation of India established under the Life Insurance Corporation of India Act, 1956 (31 of 1956) or any other prescribed insurer for his liability for payment towards the gratuity under this Act.

vi) The Contractor shall ensure documentation including the following:

a) Submission of Form No.1 to Deputy Labour Commissioner (Central);

b) Maintenance of Form F Nomination;

c) Arranging for Formation of Trust;

d) Arranging for obtaining the Scheme from Insurance Company;

e) Processing Gratuity Application Form;

f) Display of Abstract on Notice Board.

vii) The appropriate government for the purpose of this Act is the central government. .

4.0 Maternity Benefit

i) The Contractor shall not employ a woman to work during the six weeks immediately following the day of her delivery, miscarriage or medical termination of pregnancy.

ii) The Contractor shall not require a pregnant woman, to do any work which is of an arduous nature or which involves long hours of standing, or which in any way is likely to interfere with her pregnancy or the normal development of the foetus, or is likely to cause her miscarriage or otherwise to adversely affect her health before the date of her expected delivery, even on a request being made by her, during:

a) the period of one month immediately preceding the period of six weeks

b) any period during the said period of six weeks for which the pregnant woman does not avail of leave of absence to which she is entitled.

iii) The Contractor shall allow maternity benefits including leave to which a pregnant woman employee is entitled to under the provisions contained in The Maternity Benefit Act, 1961, as amended from time to time.

iv) The Contractor shall ensure:

a) Submission of Form-U before 31st January.

b) Maintenance of Register pertaining to Maternity Benefit Act.

v) The appropriate government in respect of this Act is the concerned state government.

5.0 Employees Compensation

i) The Contractor shall be liable to pay compensation if personal injury is caused to an employee by accident including certain occupational diseases arising out of and in the course of his employment resulting in death or disablement in accordance with the provisions of the Employees Compensation Act, 1923.

ii) The Contractor shall arrange for:

a) Obtaining License from any Insurance Office.

b) Submission of New Joiners list to the Insurance Office under the act.

c) Renewal of WCA Policies as the date ends.

d) Submission of Form-EE to Labour Department of the Area where the Establishment comes under.

e) Depositing the amount to the Labour Department in case of Accident or Death.

iii) Submission of Accident report to relevant authorities specified in applicable laws including:

a. Regional Labour Commissioner (Central) having jurisdiction in the area;
b. The Building and other Construction Workers Welfare Board with which the worker involved in accident is registered; The Director General appointed under the BOCW Act, 1996;
c. Inspector of Factories if the workplace is a factory;
d. The next of kin or other relative of the worker involved in the accident;
e. Commissioner appointed under the Employees Compensation Act, 1923 if the rules framed by the state government under the Act, 1923.

iv) The appropriate government for the purpose of this Act is the concerned State Government.

CHAPTER-V
Occupational Safety, Health and Welfare

1.0 The Contractor shall at all times take reasonable precautions to maintain the safety and health of his personnel. The Contractor shall provide basic and improved welfare measures to facilitate smooth and healthy working conditions.

2.0 The Contractor shall comply with the provisions contained in The Building and other Construction Workers (Regulation of Employment of Service) Act, 1996 and contractual conditions with regard to safety, health and welfare.

3.0 The Contractor shall maintain appropriate records and file returns etc., in compliance with the statutory requirements provided under The Building and other Construction Workers (Regulation of Employment of Service) Central Rules, 1998 which shall include the following:

Rule	Item	Form
23(1)	Application for registration of establishments employing building workers	I
26(3) and 239(1)	Notice of commencement/completion of building or other construction work	IV
56 and 74(b), Schedule-I	Certificate of initial and periodical test and examination of Winches, Derricks and their Accessory Gear	V
56 and 74(b)	Certificate of initial and periodical test and examination of Cranes or Hoists and their Accessory Gear	VI
70 and 74(b)	Certificate of initial and periodical test and examination of Loose Gears	VII
62 and 74(b)	Certificate of test and examination of Wire-rope before being taken into use	VIII
72 and 74(b)	Certificate of Annealing of loose Gears	IX
69 and 73	Certificate of annual thorough examination of Loose Gears exempted from annealing	X
223 (c)	Certificate of medical examination	XI
223(d)	Health register	XII
230(a)	Notice of poisoning or occupational notifiable diseases	XIII
210(7)	Report of accident and dangerous occurrences	XIV

240	Register of building workers	XV
241 (1) (a)	Muster-Roll	XVI
241 (1) (a)	Register of wages	XVII
241 (1) (a)	Form of Register of wages – cum - Muster-Roll	XVIII
241 (1) (b)	Register of deductions for damage or loss	XIX
241 (1) (b)	Register of fines	XX
241 (1) (b)	Register of advances	XXI
241 (1) ©	Register of overtime	XXII
241 (2) (a)	Wage book	XXIII
241 (2) (b)	Service certificate	XXIV
242	Annual return to be sent to registering officer	XXV
74 (b)	Register of periodical test – Examination of lifting appliances and gears etc.	XXVI

CHAPTER-VI

Compliance with other Labour Laws

1.0 The contractor shall comply with the provisions of other applicable labour laws besides the Acts mentioned in foregoing chapters.

2.0 The Contractor shall comply with the provisions contained in The Contract Labour (Regulation and Abolition) Act and take steps to:

a) Obtain a License from Assistant Commissioner of Labour (Central).
b) Submit an Annual Return in Form XXV before 15th of February.
c) Maintenance of sub-contractor registers in Form XIII.
d) Maintain records/registers as per the Act.

2.1 The appropriate government is the central government in this case.

3.0 The Contractor shall comply with the provisions of The Factories Act, 1948, wherever applicable and take steps to:

a) Renew his Factory license before 30th October every year or as the case may be.
b) Display Abstracts.
c) Submit Form-21 before 15th July (Half Yearly Returns).
d) Submit Form-20 before 15th February (Annual Returns).
e) Maintain Inspection, Accident, and Adult & Census Register.
f) Submit Accident report to Inspector of Factories.
g) Intimate Annual Holidays to Inspector of Factories before 31st of December.

3.1 The appropriate government for the purpose of this Act is the concerned State Government.

4.0 The Contractor shall comply with the State Act and notifications being made thereunder that stipulate the **National and festival Holidays and observe holidays as notified by the concerned State Government including Republic Day, Independence Day and Gandhi Jayanti. The appropriate government is the State Government for this purpose.**

5.0 The Contractor shall comply with the provisions contained in The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service).

5.1 The Contractor shall not directly or through subcontractors or agents recruit any person in a state for the purpose of employing him in the project located in an other state except under and in accordance with the license issued under this Act.

5.2 The Contractor shall abide by the duties and obligations as enumerated under this Act and furnish all such information including filing of returns or any other document with the statutory authorities, as may be required from time to time.

5.3 The appropriate government for the purpose of this Act is the Central Government.

6.0 In cases of construction of tunnels, the Contractor shall comply with the provisions of The Mines Act, 1952.

CHAPTER-VII

Implementation and Monitoring

1.0 Implementation

1.1 The provisions contained in this policy, various applicable labour laws and Bid Documents regarding staff and labour shall be complied in letter and spirit. Periodic review shall be undertaken through self-regulatory and audit mechanism.

1.2 The Contractor shall appoint the following key officials who will look after the implementation of this policy besides ensuring compliance of statutory and contractual obligations regarding occupational safety, health and welfare:

OFFICIAL	QUALIFICATION
Safety Officer	i) Degree in Engineering or Technology or Architecture with practical experience of at least 2 years; or Diploma Engineering or Technology with practical experience of at least 5 years. ii) Recognized degree or diploma in industrial safety with at least one paper in construction safety (as an elective subject) iii) Adequate knowledge of the language spoken by majority of workers of the work site.
Construction Medical Officer	a) MBBS degree from a medical institute recognized by the Medical Council of India and; b) Diploma in industrial health or equivalent post-graduate certificate of training in industrial heath; A medical officer having more than 3 years of experience in policy, execution, advice and safety and health of workers employed in mines, ports and docks, factories, building and other construction work, may be considered without the qualification mentioned at (b) above.
Welfare Officer/ Personnel Officer	(i) Degree of a recognized University or equivalent. (ii) Post-graduate Degree/Diploma in Social Work or Labour Welfare or Industrial Relations or Personnel Management or in any other allied subject of a recognized University or equivalent. (iii) 7 years' experience in a responsible capacity of Labour Welfare Work, Industrial Relations or Personnel Management

1.3 The Contractor shall appoint an adequate number of key officials and support staff trained in respective disciplines to work with. Employer's decision in regard to the staff strength shall be final and binding on the Contractor.

1.4 The Contractor shall arrange to keep all applicable updated bare Acts and rules framed there-under by respective appropriate government as mentioned in this policy, in its library. The required Forms for documentation and filing of returns etc are available in these rules.

2.0 Monitoring

2.1 A Joint coordination committee (JCC) shall be constituted by the Employer in respect of the contracts awarded by the DFCCIL where this policy is required to be implemented.

2.1.1 The JCC shall monitor the implementation of this policy.

2.1.2 The JCC shall consist of the representatives of:

i) Employer;
j) Project Management Unit (PMU);
k) Contractors;
l) Any other member as may be decided by the Employer.

The chairman of the JCC shall be nominated by the Employer.

2.1.3 The JCC shall meet once in every three months, review compliance and send report to the Employer.

2.2 A project coordination committee (PCC) shall be constituted by the JCC in respect of each contract awarded by the DFCCIL where this policy is required to be implemented. The PCC shall consist of the following members:

f) The Engineer;
g) The Contractor;
h) Representative of Workers;
i) Any other member to be nominated by the Engineer.

2.2.1 The PCC shall monitor every month the implementation of this policy at the project level and send a monthly report to the JCC.

ATTACHMENT 7

Reference for SHE Activities

Information given in this Attachment 7 shall be used for reference (but NOT deemed to be requirements) to facilitate the Contractor to establish the SHE Plan.

DFCCIL
General Instruction : DFCCIL/SHE/GI/001

MINIMUM MANPOWER REQUIREMENTS OF SHE ORGANIZATION BASED ON CONTRACT VALUE

	1	2	3	4	5	6
Awarded Contract value (Rs. in Cr.)	**Chief SHE Manager**	**Senior SHE Manager**	**Junior SHE Manager**	**Safety Steward**	**Senior SHE (Electrical) Engineer**	**Junior SHE (Electrical) Engineer**
Up to 2	-	-	1	Refer Note 1	-	1
Up to 10	-	1	Refer Note 1		1	Refer Note 2
Up to 25	1	Refer Note 1			1	
Up to 100	1				1	
Up to 250	1				1	
More than 250	1				1	

	7	8	9	10	11
Awarded Contract value (Rs. in Cr.)	**Occupational Health officer** with Necessary Nursing Assistants (Refer Note 3)	**Environmental Manager**	**Senior SHE (Traffic) Engineer** (Refer Note 4)	**House Keeping / Barricade Maintenance Squad**	**Labour Welfare Officer**
Up to 2	-	-	-	Refer Note 5	-
Up to 10	1 (PT)	1	1		1
Up to 25	1 (PT)	1	1		1
Up to 100	1 (FT)	1	1		1

Up to 250	2(FT)	1	1		1 with support staff
More than 250	2(FT)	1 with support staff	1		1 with support staff

Note 1: Adequate, qualified and trained SHE Professionals with required support staff to be deployed at each worksite at each shift.

Note 2: Adequate, qualified and trained Electrical Engineers / supervisors to be deployed at each worksite at each shift.

Note 3: (PT) means Part-Time and (FT) means Full-time.

Note 4: Senior SHE (Traffic) Engineer Post and Barricade Manager (including the staff) Posts are applicable to contracts where the work has to be executed either below or over the ROW like Viaduct, Station Contracts wherein erection and maintenance of barricades are paramount important.

Note 5: One Housekeeping Manager / Barricade Manager supported by required supervisors and workmen

Note 6: The above minimum numbers are for guidance only. The actual number will depend on project specific requirements. The Contractor shall obtain Engineer's prior consent to the final numbers and organization.

DFCCIL

General Instruction : DFCCIL/SHE/GI/002

MINIMUM QUALIFICATION AND EXPERIENCE FOR (SHE) SAFETY, ELECTRICAL, ENVIRONMENTAL, TRAFFIC ENGG. AND OCCUPATIONAL HEALTH PROFESSIONALS

Sl. No	Designation	Qualification	Experience (in years)
1	Chief Environment Officer	The Chief Environment Officer shall have qualified in any of the following degree/diploma: i) Govt. recognized PG Degree / PG Diploma / Degree in Environmental Engineering / Science ii) Post Graduate Diploma in Industrial Safety & Environmental Management (PGDISEM) from National Institute of Industrial Engineering, Hyderabad iii) M.E. in Industrial Safety from NIT, Trichy, Tamil Nadu iv) M.E. in Industrial Safety from Mepco Schlenk Engineering College, Sivakasi, Tamil Nadu v) B.E. in Fire and Safety Engg. From Cochin University of Science and Engg. Cochin, Kerala vi) B.E. with advanced Safety Management Diploma from Hyderabad / Chennai / Kolkata and Kanpur. vii) B.E / B.Arch., with one year Full Time advanced Safety diploma from NICMAR, Hyderabad. viii) B.E/B.Tech with any other equivalent State and Central Govt. recognized full time Degree / Diploma in Safety. ix) International qualifications like CSP (Certified Safety Professional), NEBOSH, MIOSH, MSISO etc.	2 {for all category except (iv) and 5yrs for category (iv)}
2	Chief Accident Prevention Officer	Same as above.	Same as above
3	Senior Accident Prevention	As stated in Sl. No:1 above and in addition the following categories:	2 {for category (i),

	Officer (Refer Note 1)	i) B.Sc.(Physics/Chemistry/Maths) with one year Full Time advanced Safety diploma from NICMAR, Hyderabad ii) B.Sc. / Diploma in Engg. with advanced Safety Management Diploma from Hyderabad / Chennai / Kolkata and Kanpur. iii) B.Sc. (Physics/Chemistry/Maths) with One year Full Time diploma in Safety Engineering offered by West Bengal State Technical Education Departments and similar courses by other states. iv) Any Graduate or diploma holder with 7 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of Engineer/ Employer on a case to case basis	(ii) and (iii) only}
4	Junior Accident Prevention Officer	i) Degree in Science / Diploma in Engineering with Govt. recognized safety diplomas from Correspondence course of NICMAR, other State Technical Education Boards etc. ii) Any Graduate or diploma holder with 5 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of Engineer/ Employer on a case to case basis	2 (for category (i) only)
5	Safety Officer (Refer Note 1)	Any basic qualification with any SHE related certificate courses.	2
6	Senior SHE (Electrical) Manager	Degree in Electrical Engineering + Govt. recognized Electrical Licence holder	2
7	Junior SHE (Electrical) Manager	Diploma in Electrical Engineering + Govt. recognized Electrical Licence holder	1
8	Senior SHE (Fire) Manager	i. B.E. (Fire) from National Fire Service College, Nagpur ii. B.E. (Fire & Safety) from Cochin University iii. Graduate with any Govt. recognized diploma in Fire Safety with 5 years of experience	2 for Category (i) and (ii) only
9	Junior SHE (Fire) Manager	Any Diploma holder with any Govt. recognized diploma in Industrial Fire Safety	1
10	Occupational Health Officer	MBBS with Govt. recognized degree/diploma in Industrial/ occupational health	1
11	Environment Officer	Govt. recognized PG Degree / PG Diploma / Degree in Environmental Engineering / Science	2
12	Senior SHE (Traffic) Engineer	Govt. recognized PG Degree / Degree / Diploma in Traffic/Transportation Engineering or Planning	1

13	House Keeping / Barricade Manager	Any Diploma in Engineering	1
14	Labour Welfare Officer	Any Degree with Govt. Recognized Degree / Diploma / P G Diploma in Labour Welfare related fields like Law, Personnel / Industrial Relations etc.	2

The qualifications and experience in respect of the following positions shall be proposed by the Contractor and seek consent of the Engineer before their mobilization at Site

(a) Sr. Environment Officer

(b) Community Liaison Officer

Note 1: In some extraordinary cases where the candidate had earlier worked successfully in DFCC Projects, they can be considered for the following posts:

i) Senior Accident Prevention Officer

ii) Junior Accident Prevention Officer

iii) Safety Officer

depending upon the qualification and no. of years of experience on a case to case basis even if they do not possess the prescribed qualification as listed above.

Note 2: In all other cases other than listed under note 1 (i), (ii) and (iii) irrespective their earlier experience with DFCC projects, the candidates shall qualify as specified above.

DFCCIL
General Instruction : DFCCIL/SHE/GI/003

MINIMUM REQUIREMENTS OF SHE MONITORING AND AUDIO-VISUAL EQUIPMENTS

1. For the purpose of minimum requirements of Audio-visual and other equipment the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Upto Rs. 25 Cr	A
Upto Rs. 100 Cr	B
Upto Rs. 250 Cr	C
More than Rs. 250 Cr	D

2. Every contractor falling into the above groups shall provide the following minimum required audio visual aids for conducting weekly review, monthly safety committee and other post review meeting of all fatal and major incidences effectively. These audio-visual equipments are a must for conducting periodical in-house safety presentations in the training programmes.

3. In addition to the above, portable hand held digital sound level meter (SLM) and portable hand held digital lux meter are also to be provided.

Sl. No	SHE monitoring and Audio-Visual Equipment details	SHE monitoring and Audio-Visual equipment required for			
		Group A Contract	Group B Contract	Group C Contract	Group D Contract
1.	Portable hand held Digital Sound Level Meter (SLM)	1	1	1	1
2.	Portable hand held Digital Lux Meter	1	1	1	1
3.	Laptop Computer with standard configuration including multi media facilities	1	1	1	1
4.	Colour Printer	1	1	1	1
5.	Computer projector with screen	-	1	1	1
6.	Overhead projector	1			

7.	35mm Camera (For taking accident investigation photos in which case the images can not be easily altered)	1	1	1	1
8.	Digital camera with flash of minimum 4 mega pixel and video facility	1	1	1	2
9.	Digital still camera with flash of minimum 4 mega pixel	1	2	4	6
10.	Portable loudspeaker (for tool-box talk and emergency purpose)	1	1	2	6
11.	Communication facility like mobile phone, walky-talky etc	For all supervisors and managers/Engineers working in Safety, Health & Environment			
12.	Accident investigation Kit containing the following:	1	1	1	2
a)	Chalk piece for marking				
b)	Measuring tape for measuring • Flexible tape – 2m length • Metal Foot long scale and • Metal tape – 30m				
c)	Equipment tags				
d)	Multipurpose Flash light				
e)	Barrier tape of 20m length				
f)	Accident investigation Forms and checklists				
g)	Enough Paper for witness recording and other noting				
h)	Emergency Phone Numbers list				

DFCCIL
General Instruction : DFCCIL/SHE/GI/004

Topics for First day at work SHE orientation training of Workmen

1. Hazard Identification Procedure

Hazards on site:

- Falls
- Earthing work
- Electricity
- Machinery
- Handling materials
- Transport
- Site housekeeping
- Fire
- Safety of nearby located structures
- Works close to railway tracks or roads

2. Personal Protective Equipment

- What is available?
- How to obtain it?
- Correct use and care.

3. Health

- Site welfare facilities
- Potential health hazards
- First Aid/CPR

4. Duties of the contractor

- Brief outline of the responsibilities of the Contractor by law
- Details of Contractor's accident prevention policy
- DFCC's SHE manual (if any)
- Building and other Constructions Welfare Law

5. Employee's Duties

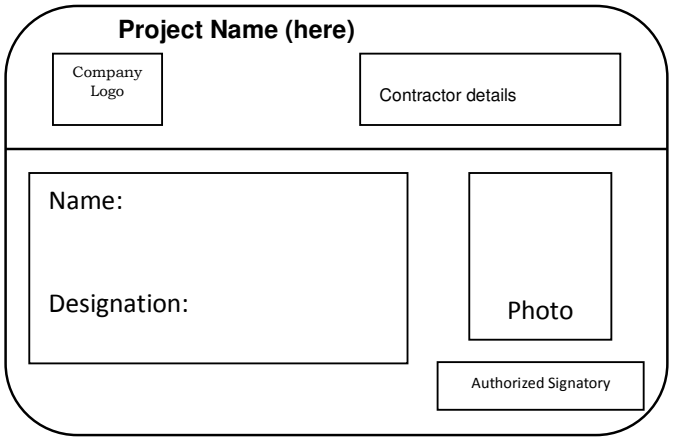
- Brief outline of responsibilities of employee under law
- Explanation of how new employees fit into the Contractor's plan for accident prevention (induction and orientation).

DFCCIL
General Instruction : DFCCIL/SHE/GI/005

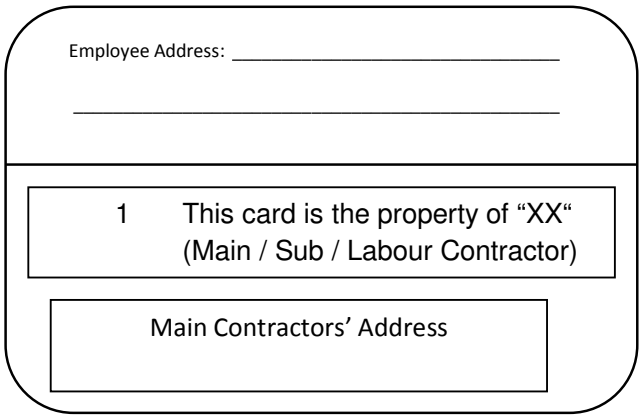
ID Card Format

(85 mm x 55mm)

Front side of ID Card:



Backside of ID Card:



DFCCIL

General Instruction : DFCCIL/SHE/GI/006 [SHE Training Matrix]

SHE Supervisors	Jr. SHE Managers	Sr. SHE Managers	Medical Officer	Clerical Staff	Security Officers	Transportation Drivers	Radiographers	Electrical workers	Other Civil workers	Mechanical workers	Steel workers	Station Building Workers	Material Handlers	Machinery Operators	Construction Foreman	Construction Supervisors	Construction Managers	Planning engineer	Quality Manager	Sr. Construction Managers	Contractor's Repr	Types of training	
●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	SHE Orientation	Management
		●	●														●	●	●	●	●	SHE Leadership	
●	●		●												●	●	●	●	●	●	●	SHE Plan	
●	●															●	●		●	●	●	SHE Improvement Plan	
●	●															●	●	●	●	●	●	Management of Change	
●	●															●	●	●		●	●	SHE Audit & Inspection	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	SHE Emergency Response & Preparedness	
●	●		●		●											●	●	●	●	●	●	Incident/Accident Investigation & Reporting	
●	●														●	●	●	●	●	●	●	SHE Communication	
●	●															●	●			●	●	SHE Promotion & Incentives	
●	●				●	●								●		●	●		●	●	●	Traffic Management	
●	●				●								●		●	●	●	●	●	●	●	Hazard Identification & Risk Analysis	
●	●				●						●	●	●		●	●	●		●	●	●	Permit to work system	
●	●																●	●	●	●	●	Confined space entry	
●	●	●	●		●						●	●	●				●		●	●	●	scaffolding	
●	●		●	●	●	●	●	●	●	●	●	●		●		●	●		●	●	●	Waste Management	
●	●	●													●	●	●			●	●	Environment Monitoring	
●	●		●												●	●	●		●	●	●	Labour welfare measures	
●	●														●	●	●		●	●	●	Behavioural Based Safety Management (BBSM)	
●	●														●	●	●		●	●	●	Job/Task Safety Analysis (JSA)	
●	●														●	●	●		●			Safety Training Observation Programme (STOP)	Supervisor
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Industrial First Aid & CPR	
●	●				●								●		●	●	●					Incident / Accident Investigation & Reporting	
●	●			●	●	●	●	●	●	●	●	●	●	●	●	●						Fire fighting	
●	●														●	●						Confined Space Testing & Certification	
●	●														●	●						Scaffold Erection & Inspection	
●	●								●	●	●	●		●	●	●	●			●		Rigging	
●	●														●	●	●					Wire Rope Inspection	
●	●														●	●	●					Crane Inspection	
●	●														●	●	●					Electrical/Mechanical Isolation	
●	●							●	●	●	●	●			●	●	●					Permit to Work System	
●	●							●	●	●	●				●	●						Confined Space Working	Specific
●	●									●					●	●						Explosive Handling & Control	
●	●								●	●	●	●	●		●	●						Heavy Lifting Operation	
●	●							●							●	●				●		Radiography (X-Ray)	
●	●							●	●	●	●	●	●		●	●						HAZMAT Handling & Control	
●	●											●			●	●						Welding, Cutting & Bracing	
●	●												●		●	●						Power Actuated Hand Tool	
●	●								●	●	●				●	●						Electrical/Mechanical Isolation	
●	●								●	●	●	●	●		●	●						Roofing Work	
●	●											●			●	●						~~Steel erection work~~	
●	●							●	●	●	●	●			●	●						Scaffold Erection/Dismantling	
●	●									●		●			●	●						False-work Erection / Dismantling	
●	●								●	●	●				●	●						~~Painting in Confined Area~~	

General Instruction: DFCCIL/SHE/GI/007

SHE Training details for Managers and Supervisors

1. The Law and Safety	**2. Policy and Administration**
Statutory requirement Appropriate regulations Duties of employer and employee	Effect of incentive on accident prevention SHE Policy Industrial relations Safety Officer: duties, aims, objectives
3. Safety and the Supervisor	**4. Principles of Accident Prevention**
Safety and efficient production Accidents affect morale and public relations	Attitudes of management, supervision and operations Methods of achieving safe operations Accident and injury causes
5. Site Inspection	**6. Human Behavior**
The role of management Hazard Identification Procedure Records results Follow-up procedures Feedback	Motivating agencies Individual behavior Environmental effects Techniques of persuasion
7. Site housekeeping	**8. Health**
Site organization Relationship of site housekeeping to accident occurrence Site access Equipment storage Material stacking Materials handling	Medical examination Hazard to health on site Sanitation and welfare Protective clothing First Aid/CPR
9. Personal Protective Equipment	**10. Electricity**
Eye, face, hands, feet and legs Respiratory protective equipment Protection against ionizing radiation	Appreciation of electrical hazards Power tools Arc welding Low voltage system Lighting and power system on sites ELCB, RRCB, Grounding/Ground fault circuit interrupters (GFCIs)
11. Oxygen and Acetylene Equipment	**12. Equipment**
Cylinder storage and maintenance Condition and maintenance of valves, regulators, and gauges	Accidents related to moving parts of machinery Appreciation of principles of guarding

Condition and maintenance of hoses and fittings Pressures	Importance of regular maintenance
13. Transportation	**14. Excavations**
Transport to and from site Hazard connected with site transport Competent drivers Dumpers Tipping trucks Movement near excavations	Method of shoring Precautions while shoring Precautions at edge of excavations Removal of shoring Sheet steel piling
15. Working platforms, Ladders, and Scaffolding	**16. Cranes and other Lifting Machines**
Hazards connected with the use of ladders Maintenance and inspection Type of scaffold Overloading Work on roofs Fragile material	Licensing, certification and training required for operation of cranes Slinging methods Signalling Access to crane(s) Maintenance and examination Ground conditions
Openings in walls and floors Use of safety belts and nets	Hazards and accident prevention methods connected with the use of different types of cranes/heavy equipment Crane Lift Plan for all lifts
17. Lifting Tackle	**18. Fire Prevention and Control**
Slings - single and multi-legged Safe working loads (SWLs) Safety hooks and eyebolts Cause of failure Maintenance and examination	Principle causes determining fire Understanding fire chemistry Fire fighting equipment Fire fighting training
19. Communications	
Effective methods of communication (particular interest to non-English speaking workers) Method and preparation of reports Safety committees Safety meeting	

DFCCIL

General Instruction : DFCCIL/SHE/GI/008

DAYS TO BE OBSERVED FOR CREATING SHE AWARENESS

1st Monday to Sunday of January	Road Safety Week (Subjected to confirmation from Ministry of Road Transport, Govt. of India every year.)
16th February	Kyoto Protocol Day
March	Red Cross Month
May 1 to 7	Emergency Preparedness Week
4th March	National Safety Day
7th April	World Health Day
14th April	Fire Safety Day
April 18 to 22	Earth Week
20th April	Earth Day
20th April	Noise Awareness Day
28th April	ILO World Day for Safety and Health at Work Day
5th June	World Environmental Day
12th June	World Day against Child Labours
9th July	Occupational Health Day
17th October	World Trauma Day
1st December	World AIDS Day

DFCCIL

General Instruction : DFCCIL/SHE/GI/009

Minimum Requirements of SHE Communication Posters / Signages / Video

1. For the purpose of Minimum requirements of SHE Communication Posters / Signages / Video the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Up to Rs. 25 Cr.	A
Up to Rs. 100 Cr.	B
Up to Rs. 250 Cr.	C
More than Rs. 250 Cr.	D

2. Every contractor falling into the above groups shall prepare a SHE Communication Plan as a part of site specific SHE Plan and shall include the following minimum requirement of Posters / Signages / Video as applicable. In case readymade posters are available in any of the category from National Safety Council or any other safety related organizations they may procure the same and display it. In case the same is not available then the contractors' shall make necessary arrangements to get the posters designed and printed on their own. All posters shall each be in Hindi, English and the regional language.

   All the above are to be detailed in the Contractor's Site Specific SHE Plan and he shall obtain the Engineer's prior consent for the numbers, contents, locations, etc.

Table No.: 1 - Minimum No. of Posters

Sl. No	SHE Poster Title	Minimum No. of concepts in each title	No. of Posters / Signage / Video			
			Group A Contract	Group B Contract	Group C Contract	Group D Contract
1.	Safety Culture	5	Each 10	Each 50	Each 75	Each 100
2.	Daily Safety Oath	1English, 1 Hindi & 1 in regional language	Each 100	Each 200	Each 500	Each 1000
3.	Mandatory PPE Usage					
a)	Signages to display the messages like PPE	2 types of sizes	Each 25	Each 50	Each 75	Each 200

	ZONE, NO PPE ZONE, HARD HAT AREA etc.	made up of metal sheet to be mounted at different locations				
b)	Helmet	5	Each 25	Each 50	Each 75	Each 200
c)	Shoe	5	Each 25	Each 50	Each 75	Each 200
d)	Goggles & Ear Protection	5	Each 25	Each 50	Each 75	Each 200
e)	Full Body Harness	5	Each 25	Each 50	Each 75	Each 200
f)	Hi-Vi Jacket	5	Each 25	Each 50	Each 75	Each 200
4.	Emergency Management Plan	5	Each 25	Each 50	Each 75	Each 200
5.	Working at Heights	10	Each 25	Each 50	Each 75	Each 200
a)	Ladder, Stairway, Scaffold - Signages to display the messages like SAFE, UNSAFE, FIT FOR USE, AVOID USE etc.	5 types of sizes made up of metal sheet to be mounted at different locations	Each 25	Each 50	Each 75	Each 200
6.	Site Electricity	5	Each 25	Each 50	Each 75	Each 200
7.	Crane Safety	5	Each 25	Each 50	Each 75	Each 200
8.	Slings	5	Each 25	Each 50	Each 75	Each 200
9.	Rigging Procedures	5	Each 25	Each 50	Each 75	Each 200
10.	Excavation	5	Each 25	Each 50	Each 75	Each 200
11.	Occupational Health (Mosquito Control, HIV/AIDS awareness, Dust Control, Noise Control, No Smoking/Spitting, etc.)	10	Each 25	Each 50	Each 75	Each 200
12.	First – Aid	3	Each 25	Each 50	Each 75	Each 200
13.	Labour Welfare Measures (Payment of Minimum Wages, Avoidance of Child labour, Signing in the Muster Roll, In case of accidents-what to do? Etc	5	Each 25	Each 50	Each 75	Each 200
14.	Importance of "Safety Handbook"	1	25	50	75	200

15.	Traffic Safety (Speed limit, safe crossing and working within barricaded area etc.)	5	Each 25	Each 50	Each 75	Each 200
16.	Environmental Monitoring (Spillage of Muck, hazardous material, Improper drainage, water spray for dust containment etc.)	5	Each 25	Each 50	Each 75	Each 200
17.	Video in Hindi on PPE usage – 15 minutes duration	1	-	-	-	1

Note 1: Items mentioned under 17 is video. Items under 3 (a) and 5 (a) are metal signage boards and all other items are posters.

Note 2: The above minimum numbers are for guidance only. The actual number will depend on the project's specific requirements. The Contractor shall propose and obtain Engineer's prior consent to the final numbers, locations, etc.

Table No.: 2 – Size of Posters / Signages

Sl. No	Item	Size
1.	Posters – Standard	17"x22" –135 GSM 4 Colour Printing
2.	Posters – Special (Wherever required)	17"x22" card laminated FA Poster
3.	Posters - Mega size (Wherever required)	32"x40" Flex FA Poster
4.	First-Aid Booklet	6"x4"
5.	Safety Handbook	6"x4"
6.	Signages	Small : 12"x6" Big : 24"x12"
7.	Road Traffic Sign Boards	Strictly as per Indian Road Congress (IRC) specifications

Table No.: 3 – Safety Signage Colour (as per IS: 9457)

Sl. No	Type of signage	Colour
1	Mandatory	Blue
2	Danger	Yellow
3	Prohibitory	Red
4	Safe conditions	Green

DFCCIL

General Instruction : DFCCIL/SHE/GI/010

Experts / Agencies for SHE Services

Sl. No.	Organization	Services
1.	Bureau Veritas India Pvt. Ltd.,	• SHE Management / Technical Training
2.	BSI Management Systems The Mira Corporate Suites (A-2) Plot No.: 1 & 2, Ishwar Nagar Mathura Road New Delhi – 110 020 Phone : 011-2692 9000 Fax. : 011 – 2692 9001 E-mail: rajk.prasad@bsi-global.com	• SHE Management / Technical Training
3.	Central Labour Institute	• SHE Management / Technical Training
4.	Construction Industry Development Council 801, 8th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019	• SHE Management / Technical Training
5.	Det Norske Veritas AS,	• SHE Management / Technical Training
6.	DuPont Safety Resources, E.I. DuPont India Private Limited, Arihant Nitco Park 6th Floor, 90, Dr. Radhakrishnan Salai, Mylapore, Chennai-600 004 Phone: 044-2847 2800, 2847 3752 Fax: 044-2847 3800 Mobile: 9381201040 Website: in.dupont.com	• SHE Management Training
7.	EQMS INDIA PVT. LTD. E-49, 1st Floor, Dazzle House, Jawahar Park, Main Vikas Marg, Laxmi Nagar, Delhi-110 092 Phone: 91-11-220 17639/2204 4754 Fax: 91-91 2201 5150 E-mail: eqms@eqmsindia.org	• ISO Certification • SHE Management / Technical Training

	Website: www.eqmsindia.com	
8.	Green Cross Consultants 59, 7th Cross, 1st Floor, Jai Bharath Nagar, Banglore-560 033 Phone: 080-2549 6782 E-mail: etgrangan@yahoo.com	• SHE Management / Technical Training
9.	Pentasafe Academy,	• SHE Management / Technical Training • SHE Practical Field Training for Height Safety
10.	International Engineering Company K – 10, South Extension, Part – 2, New Delhi – 110 049 Phone: 011 – 26254761, 26258130 Mobile: 9312260130 E-mail: ashok@intenco.net	• Crane and Lifting appliances and Gears Certification • SHE Practical Field Training for Crane Safety
11.	L & T Eutectic 32, Sivaji Marg New Delhi – 110 015 Phone: 011 - 51419538, 51419539 Fax: 011 - 51419600 Website: www.lnteutecticwelding.com	• SHE Practical Field Training for Welding Safety
12.	MFA Crucial Moments Healthcare Pvt. Ltd., 42, Okhla Industrial Estate, Phase – II New Delhi – 110 020 Phone: 011 – 55624000 Fax: 011 – 55624010 E-mail: contact@crucialmoments.net	• First-aid Training
13.	Modicare Foundation 4 Community Centre, New Friends Colony, New Delhi – 110 065 Phone: 011 – 5167235059, Fax: 011 – 26915469 E-mail: nivedita@modi.com, nivedita@gmavil.com Hyderabad Add.: 107, Center Point Andheri Kurla Road, JB Nagar, Andheri (E) Hyderabad – 400 059, Mob.: +91 98205 78021	• HIV / AIDS awareness training
14.	National Productivity Council	• SHE Management / Technical Training
15.	National Safety Council	• SHE Management / Technical Training
16.	NICMAR (National Institute of Construction Management and Research) 910,9th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019	• SHE Management / Technical Training

	Phone: 011 – 51618415, 51618417, 51618418 Fax: 011 – 51618416	
17.	Quality Growth Services Pvt. Ltd. H-13, Kirti Nagar, New Delhi – 110 015 Fax: 011 – 25431737 / 25438598 / 25918332 E-mail: qgs@qgspl.com Website: www.qgspl.com	• ISO Certification
18.	Safety Engineers Association (India) Flat No.:12, Block No.: 3 Mansarovar Apartments 11 / A Arcot Road Porur, Chennai – 600 116 Phone: 044 – 2476 8697 E-mail: seaindia@yahoo.com	• SHE Management / Technical Training
19.	SGS India Private Limited	• SHE Management / Technical Training
20.	SHE Management Consultancy & Support Services, 145 A, Pocket-VI, (DDA Flats), Kondli Gharoli, Mayur Vihar-II, Delhi-110 096 Fax: 011-2262 5015 Mobile: 9811153873 E-mail: r_k_p@vsnl.net	• SHE Management / Technical Training
21.	St. Johns' Ambulance Red Cross Road New Delhi – 110 001	• First-aid Training
22.	TUV SUD South Asia	• SHE Management / Technical Training
23.	Western India Automobile Association	• SHE Practical Field Training on Defensive Driving
24.	Welding Research Institute Bharat Heavy Electricals Ltd. (BHEL) Trichirappalli, Tamil Nadu – 620 014 Phone: 0431 – 2577029, 2577283 Fax: 0431 – 2520770 E-mail: wri@bheltry.co.in	• SHE Practical Field Training for Welding Safety

DFCCIL

General Instruction: DFCCIL/SHE/GI/011

MINIMUM LIGHTING REQUIREMENTS

S. No.	Facility or Function	Luminance – Ix (lm/ft^2)
1.	Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)
2.	Construction areas - general indoor - general outdoor - tunnel and general underground work areas (minimum 110 lux required at tunnel and shaft heading during drilling, mucking and scaling)	 55 (5) 33 (3) 55 (5)
3.	Access ways - exit ways, walkways, ladders, stairs	 110 (10)
4.	Maintenance / Operating areas / shops - vehicle maintenance shop - carpentry shop - outdoors field maintenance area - refueling area, outdoors - shops, fine details work - shops, medium detail work - welding shop	 325 (30) 110 (10) 55 (5) 55 (5) 540 (50) 325 (30) 325 (30)
5.	Mechanical/electrical equipment rooms	110 (10)
6.	Hoists, Elevators, freight and passenger	215 (20)
7.	Warehouses and storage rooms/area - indoor stockroom, active/bulk storage - indoor rack storage - outdoor storage	 110 (10) 270 (25) 33 (3)
8.	Health Centres and First aid stations and infirmaries	325 (30)
9.	Toilets, wash and dressing rooms	110 (10)
10.	Work areas – general (not listed above)	325 (30)
11.	Parking areas	33 (3)
12.	Visitor areas	215 (20)
13.	Laboratories	540 (50)

DFCCIL

FORM No. : SF/001

FORMATION OF PROJECT SHE COMMITTEE	
Contract No.	
Contractor Name	
Contract Title	

CIRCULAR

Committee

The following SHE Committee is constituted with immediate effect:

Chairman:

Members:

1)
2)
3)
4)
5)

Secretary:

Periodicity

The committee will meet at least once in a month on the day (specify date)

Agenda

Secretary will circulate agenda of the meeting at least seven days in advance of the schedule date of the meeting.

Circulation

Gist of the meeting will be minuted in the standard format and circulated to the following under the signature of the secretary

1. Chairman
2. DFCCIL Representatives
3. Members
4. others concerned

Date:

Signed By: ----------

CHAIRMAN

DFCCIL

Form No.: SF/002

MINUTES OF SAFETY MEETING			
Contract No.:			
Contractor Name			
Contract Title			
Meeting No.		Date of Meeting	
Location of meeting			

MEMBERS PRESENT	**INVITEES**	**MEMBERS ABSENT**

REPORT SENT TO					
No. of Copies	Name / Dept.	No. of Copies	Name / Dept.	No. of Copies	Name / Dept.

Prepared By: Location: Date:

MINUTES OF SAFETY MEETING

Item No.	**Description of Discussion**	**Action By**	**Target**	**Remarks**
1	Complaints received from Engineer / Employer and corrective and preventive action			

2	Review of MOM of previous meeting			
3	DFCCIL's / Observation from third party			
4	First - Aid cases / Reportable accident cases			
5	Future jobs and specific requirement			
6	Status of implementation of Safety plan			
7	Sub-contractor performance			
8	Analysis of first-aid cases			
9	Need for any specific system / training / PPE's / resources			
10	Observation of safety committee during last walk down			

Next meeting is scheduled on:

Date :	Chief Accident Prevention Officer (Signature & Name)
Date :	Contractor's Representative (Signature & Name)