



East Central Railway
(Construction Organisation)

Office of the Chief Administrative Officer (Con), Mahendrughat, Patna - 800004

No. ECR/CAO/Con/Consultancy/EPC Project/01/2019

Dated – 28.06.19

Expression of Interest (EOI)
(CONSULTING SERVICES – SHORTLISTING FIRMS)

East Central Railway (Construction Organization) intends for short-listing of experienced consultants for providing consultancy services, to undertake preparatory activities for inviting EPC works tenders and bid process management for finalization of EPC contracts for the various construction projects of New Lines, Gauge conversion, Doublings, Road Over Bridges etc on East Central Railway.

The consulting services include following activities:

- * Final Location Survey
- * Land acquisition proposals
- * ESP of station yards etc.
- * Structural design & proof-check
- * Updation of Detailed Estimate, Assistance in obtaining mandatory clearances, preparation of BOQ for EPC tender etc.. etc..
- * Field Geo-technical investigations
- * GAD of Bridges, buildings & structures
- * SIP, Cable route plan & other S&T works
- * Plan for OHE and other Elect. Works

EOI document (*which incorporates Indicative Terms of Reference, i.e, TOR*) are available in the office of CAO(Con), Mahendrughat, Patna-4 on production of demand draft from any Nationalized/Scheduled bank in favor of FA & CAO/Con/ECR, Mahendrughat, Patna for **Rs. 5,000/-**, between 10.00 Hrs. to 16.00 Hrs. on any working day from **01/07/19 to 19/07/19**. In case, any tenderer wishes to obtain the tender document by post, Rs. 500/- (Five Hundred only) extra should also be sent by demand draft.

The document can be found at <http://www.ecr.indianrailways.gov.in>. The documents downloaded from website should also be enclosed with a demand draft of Rs. 5,000/-. The shortlisted consultants will be considered for submission of their financial bid at a later stage for selection of consultant for any of the construction projects on ECR.

Interested eligible consulting firms (Consultants) who have experience & expertise in the activities are requested to submit their letter of interest & EOI documents and other enclosures in support of their qualifications and relevant experience to perform the Services, **latest by 22.07.19 (16.00hrs)**.

The shortlisting criteria are:

- a. The firm should have Minimum Experience of 03 major similar assignments (Civil Engg.) of Rs.50 Lakhs or more, completed in past 7 years for infrastructure surface transport projects with preference for experience on Railway (includes DFCCIL projects)/Metro projects. Copy of work completion certificates as well as the agreements of such completed projects should be submitted to ascertain the actual nature of works done.
- b. Minimum average annual consultancy turnover of past 03 years should be Rupees 03 (Three) Crores.
- c. The firm should have qualified and experienced Key Professionals as per requirement given in Terms of Reference.

Consultants may associate with other firms in the form of a joint venture or a sub-consultancy to enhance their qualifications. The Consultant will be selected in accordance with the QCBS method set out in the Railway Board's Guidelines issued vide Letter No.2017/Trans/01/Policy dated 27.11.2017. Further information can be obtained at the address below during office hours between 10:00 hrs. to 17:00 hrs. on working days.

Address for correspondence:

Narendra Singh, CE/C/PLG,
Office of CAO/Con/MHX,
East Central Railway (Construction Organization),
Mahendrughat, Patna – 800004.

Phone & Fax: 0612-2677257,

Email: cecplgecr@gmail.com and/or dycecsurveyemhx@gmail.com



पूर्व मध्य रेल
(निर्माण संगठन)

East Central Railway
(Construction Organisation)

CALL FOR EXPRESSION OF INTEREST (EOI)

For Short-listing of CONSULTANTS

FOR

Preparatory activities of detailed engineering including Final Location Survey, Soil investigations, land acquisition, preparation of GAD, structural design and proof-check, preparation of BOQ and bid process management for EPC works tenders for execution of different construction projects on East Central Railway under Construction Organisation.

Indicative Terms Of Reference (TOR)

EOI RESPONDE DOCUMENTS WILL BE RECEIVED UPTO 16.00 HRS. ON 22.07.2019

EOI RESPONDE DOCUMENTS WILL BE OPENED AT 17.00 HRS. ON 22.07.2019

NAME OF THE FIRM/CONSULTANT(s) and ADDRESS:

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Indicative Terms Of Reference (TOR)

Important: This current document is an Expression of Interest (EoI) to solicit and examine the response of the firms/consultants and thereafter short-list the respondents who are capable of executing the consultancy works as mentioned in subsequent paragraphs.

Background: Railways have decided to adopt EPC mode of tendering for execution of the work of construction of New BG Railway Line from Jhajha to Batia and many other projects.

In view of the decision to go in for EPC, all the preparatory works of final location survey, soil exploration, finalisation of following drawings/design and documents has to be completed before inviting EPC tenders.

These include:-

Alignment and Longitudinal Section of the project (includes final location survey and mapping of utilities)

General Arrangement Drawings of Important Bridges/Major Bridges/Minor Bridges/ROBs/RUBs/LHS/FOBs (includes geotechnical investigation and hydrological survey)

Structural Design of foundation & sub-structure for Important/Major Bridges including proof-checking by an IIT or NIT.

Engineering Scale Plans (ESPs) of station yards

Signal Interlocking Plans (SIPs)

Layout Plans for OHE

Cable Route Plans

Layout Plans for Buildings

Updation of DPRs (including updation of detailed estimate)

Method statement and sequence of working including yard remodelling in case of works of Doublings/3rd line/4th line

Land Acquisition proposals to state revenue authorities for land acquisition and forestry clearances wherever required

Further, to assist the employer in processing and finalisation of EPC works tenders, assistance in bid process management is needed from the experts/experienced firms.

It has therefore been decided to engage consultant for above indicated services. Expression of Interest is invited from willing qualified consultants to shortlist the firms for these services. There are number of sanctioned projects and many of them will have to be executed using EPC mode of tendering. The shortlisted consultants will be issued with prescribed format/document to submit their financial bid for finalising the consultant for each of these projects separately. No separate RFP will be invited for shortlisting the consultant for individual projects and the list of consultants shortlisted in the instant notice will be utilised for issue of invitation of financial bids for each of the future projects separately. Thus the shortlist of consultants will be something similar to panel of consultants for the preparatory services for EPC tenders on East Central Railway (Construction Organisation).

The list of projects sanctioned are as under:

Sl. No.	State	Name of project in brief	GC, NL, DL	Length (Km)	Project Cost (Cr. of Rs.)
1.	Bihar	Jhajha – Batia New Line	NL	20.00	496.367
2.	Jharkhand	Parasnath – Madhuban – Giridih New Line	NL	49.00	902.86
3.	Bihar	Supaul – Araria New Line	NL	92.00	306.41
4.	Bihar	Muzaffarpur-Darbhanga New Line	NL	66.90	282.30

The scope can be broadly grouped in two parts:

1. Consultancy services covering all activities relating to detailed engineering of the project, viz. final location survey, L-section and index plan, geotechnical investigation, utility survey, GADs of bridges, buildings and other structures, Structural design of foundation & sub-structure of major bridges and any other structure if required, ESPs & SIPs of station yards, land acquisition plans & proposals, cable route plans, Layout plans for OHE, planning of electrical and S&T installations, preparation/updation of detailed estimate, etc.
2. Consultancy services for bid process management covering preparation of bid documents and required bid drawings, assistance to employer in processing and finalization of bids etc.

The details of services required from the consultant are as under:

1. Consultancy services covering all activities relating to detailed engineering of the project:-

- 1.1 This includes carrying out consultancy services for Final Location Survey, Geotechnical investigation, Preparation of GADs of Bridges, design of foundation and sub-structure of major bridges and its approval, Buildings, land acquisition plans and proposals, Detailed Estimation/updation of detailed estimate including planning for OHE, substation, General Electrical works including Transmission line, power augmentation, infringement removal of aerial lines etc & planning for all required S&T works and other misc. works of the project as per requirements.

- 1.2 The services under this part are required to be completed in **04 months**.

2. Activities of the consultancy work

- (i) Conducting detailed Final Location Survey (FLS) for preparation of Plans/L-sections for the proposed project. The design of the alignment will be done using Mx Rail/Bently software and plans & drawings will be plotted on AutoCAD software.
- (ii) Conducting a traverse survey and topographical survey for a width of 100m on either side of proposed center line, collection and incorporation of field details like existing streams, water courses, bridges, their types, bed levels, spans, HFLs, Flyovers via duct/ROB/RUB/FOBs, irrigation canals/channels, their reduced levels, sections/openings (having a bearing on proposed lines), roads, Rail lines, HT/LT power lines, OHE lines, structures, S&T installation lines, telephone/ other communication lines, Telephone Posts, level crossings, religious edifices and structures etc. in the project sheets.
- (iii) Traversing/conducting total stations survey of rivers/streams

- (iv) Traversing / conducting total station survey of existing station yards and up to 1km on approaches beyond outer most points. In case of long haul stations this survey will be required up to 1.5km.
- (v) Conducting leveling and furnishing the ground levels for generating Digital Terrain Module (DTM) for finding longitudinal and cross section of the proposed alignment and calculation of cross sectional area. All the levels shall be furnished with reference to GTS bench marks and GTS BM should be established at the location of bridges and stations.
- (vi) Conducting check leveling along the final alignment duly establishing the bench marks.
- (vii) Soil Investigation by taking bore-logs and preparation of proposals for the extension/rehabilitation of existing bridges or for construction of new bridges on diverted alignment.
- (viii) Preparation and submission of raw & processed data, detailed calculation of quantities and documents including preparation and submission of 3 sets hard copies and two sets of soft copies of following plans as per Para 443 of Indian Railways Code for the Engineering Department:
 - a) General Map of the country traversed by the project scale of 25 Km to 1 cm.
 - b) Index map on a scale of 2.5 KM to 1 cm.
 - c) Index plans and sections on a scale of 0.5 km to 1 cm horizontal and 10m to 1 cm vertical.
 - d) Detailed plans and sections to a scale of 1:5000 horizontal and 1:500 vertical.
 - e) Plans and cross sections
 - f) Plans of existing/proposed station yards.
 - g) Detailed drawing of structures
 - h) Plans of Junction arrangements

2.1 Geo-technical Investigation

These are to be carried out as per RDSO Guidelines and Specifications for Design of Formation for Heavy Axle Load-2008 for 25T loading and as per instructions of the Engineer.

Consultant shall carry out Geo-technical investigation along the alignment, at major/minor bridges, cutting /filling and building sites as required

- (a) Drilling of 100 mm diameter boreholes through soil overburden material along alignment normally at 200m to 300m apart in case of uniform type of soil and closely spaced in critical zones and at each pier and abutment locations of bridges as per RDSO specification/manuals/guidelines.

- (b) Drilling of 'Nx' Bit size boreholes as per IS:6926 at each pier and abutment in rock up to a maximum depth of 5m at each location. The depth of drilling is tentative and may vary from borehole to borehole depending on the geological conditions. Observation during drilling to be recorded in a Performa as given in IS:5313 Appendix A and drilled rock samples to be preserved as per IS code to derive the RQD value.
- (c) Conducting standard penetration tests in all types of soil deposits met within a bore hole, at intervals of 1.5m and every change of strata. The starting depth of performing SPT shall be between 1.0 m and 2.0m depth below ground level in alternate boreholes.
- (d) Collection of undisturbed soil samples of 100mm dia. and 450mm length in standard UD tubes at every change of strata and at regular intervals of 3.0m. Sampling shall confirm to IS: 1892, 2132 & 8763.
- Collection of disturbed samples at regular intervals to provide description of soil profile and its variation. Samples be collected in boreholes at 1.5m intervals starting from G.L. and at every change of strata.
- Method of sampling shall conform to IS: 2132 and classification of samples shall conform to IS: 1498.
- (e) Conducting various laboratory tests as per IS: 2720 from approved laboratory by using approved apparatus complying with the requirements and specifications or Indian standards or other approved standards for this class of work.

Tests on disturbed Samples

- Visual and Engineering Classification
- Sieve Analysis and Hydrometer Analysis
- Liquid, Plastic and Shrinkage limits
- Specific Gravity
- California Bearing Ratio (CBR)
- Chemical analysis
- Shrinkage limit and free swell index determination

Test on Undisturbed Samples

- Density and Moisture Content
 - Unconfined Compression Test
 - Box Shear Test (in case of sand)
 - Tri-axial Shear Tests
 - Consolidation
- (f) Establishment of ground water table if encountered.
- (g) Areas of prospective borrow soil and blanket material should also be surveyed and tested for IS Classifications and CBR value to give idea of quality as per RDSO Guidelines and Specifications and quantity of materials to be used for construction of Railway embankment

- (h) Analysis of field and laboratory test results and preparation of report giving recommendation for bearing capacity and type of foundation. Visual soil investigation by way of examining the existing cuttings and banks materials and mentioning type of soil against each chainage.

The data and information collected during survey/investigations should be presented in suitable format such as graphs, bar chart or in tabular or statement form.

2.2 GADs and Type Designs of bridges:

GADs for major bridges of various standard & non-standard spans, minor bridges consisting of various RCC boxes & RCC/PSC slabs, ROB/ RUB's, Fly over/ Viaduct , FOB'S shall be prepared keeping in view the requirements based on survey data and all new bridges shall be as per 25 T loading standards. The foundation proposed for bridges shall be based on geotechnical investigation details. Design Basis Report for important Bridges is to be prepared after obtaining all required field details as per standard proforma.

The typical designs of these bridges shall be made as per finalised GADs considering proposed foundations based on geo-tech investigation report and the superstructure based on RDSO designs for the respective spans for 25 T loading. This is required for preparation/updation of detailed construction estimate.

2.3 Drawings

For the guidance of Consultants, list of drawings is given below which are required to be prepared. This list is not exhaustive and any additional drawings considered necessary for execution shall have to be prepared by the Consultant.

1. Confirmation/Modification of L Section, alignment plan of FLS and approval thereof from Railways.
2. Typical Earthwork cross section for cutting and banking as per RDSO guidelines.
3. Conceptual Drawings of Protection work of Bank & bridges and preparation of plans thereof.
4. Preparation of Engineering Scale Plans (ESP) of yard modifications as necessary and approval thereof from Railways.
7. Preparation on GADs of Major Bridges (drawings) ROB/ RUB's, LHS, Fly over/ Viaduct and approval thereof from Railways.
8. Preparation of GADs of Minor Bridge (drawings) and approval thereof from Railways.
9. Station buildings including other buildings – layout plan and GADs of Station buildings and other building structures and approval thereof from Railways.
10. PF shelters, extension/Provision of FOBs, Extension/Provision of Platforms, - Layout plan and approval thereof from Railway.

11. Residential quarters including services buildings – Layout plan and approval thereof from Railway.

Note:

- (i) Drawings to be submitted shall be one on tracing, 2 soft copies on CD and 3 hard copies on white prints after approval, the cost of which is included in the schedule. Cost of advance drawings submitted for getting approval of Railway also included in the scope. All tracing drawings shall be submitted on tracing film (75 micron double matt film).
The drawings/designs submitted by consultant will become Railway's property and Railway will have the right to use them in other projects also.
- (ii) Procurement/Collection and submission of relevant standard drawings of RDSO/Railway and utilization thereof in work to the extent possible shall be responsibility of the Consultant.

2.4 Preparation of Land Plans:

2.8.1 The projects may require additional land acquisition. In course of deciding the final alignment where land acquisition is involved the scheme for the same is to be prepared by the Consultant. The scheme will contain the following:

- (i) The centre line of proposed alignment and also the corridor of land acquisition shall be marked on the ground at each 100 M interval or as directed by Engineer.
- (ii) Revenue village map of the entire area shall be collected by the Consultant.
- (iii) The centre line of proposed Railway alignment & also the corridor of land acquisition shall be marked on revenue village map.
- (iv) Record of Rights of all plots which are falling in the proposed land acquisition corridor shall be collected from Revenue department. Details of Govt & forest land should also be collected.
- (v) Plot wise area of land acquisition (Private/Govt/Forest) shall be calculated.
- (vi) Ratio of area of plot proposed to be acquired to the total plot shall also be calculated. Details of buildings, water sources etc coming in way of proposed alignment shall also be submitted separately.
- (vii) Collection of sale data of land transactions of last five years required for land acquisition (Private Land).
- (viii) Collection of all relevant details of government & forest lands separately to facilitate preparation of papers for their acquisition.
- (ix) The scope of work will include plotting the land boundary on drawing.
- (x) Preparation of Land acquisition proposal and procedure of acquisition is to be followed as per prevailing guide line/policy in vogue .

3.0 TERMS OF REFERENCE

3.1 CIVIL Engineering:

Copy of the Detailed Project Report (DPR) of the project will be given to the consultant for reference purposes. All salient features of the project will be given in the DPR.	
1	The Consultant shall study the feasibility of locating the tentative/final alignment on the ground in Final Location Survey as per the DPR given to him. Wherever it is not possible to stake the alignment as per the DPR so provided, he shall make necessary field trials to arrive at a suitable alignment at all such locations and fix the same, duly taking the approvals from Railway for all such deviations.
1.1	<u>Survey Equipment to be used for the work and accuracy of measurements</u>
(i)	The Consultant shall use Total Stations having a least count of not more than 1 seconds and auto levels.
(ii)	Fixing and pegging the center line including setting of the curves shall be carried out with total stations. All angular measurements shall be taken using total stations.
(iii)	All levels shall be taken using auto-levels and connected to the nearest GTS bench marks available in the area, the details of which shall be obtained from Survey of India offices.
(iv)	As far as possible all distances shall be measured by using Total Station and shall be submitted in MOSS format, using uniform feature code for each string.
(v)	The linear measurements shall have an accuracy of $\pm (5\text{mm} + 5\text{ppm times base line length})$.
(vi)	The levels shall be accurate up to $6 \sqrt{K}$ mm where K is the circuit length in Kilometers.
(vii)	The consultant will be responsible for the quality of the survey work done. The correctness of the survey work is of paramount importance.
2	The Consultant shall pick up the existing details and carry out topographic survey of the terrain for at least 100m on either side of the proposed one or more alignments including traversing along the routes, duly observing the following:
(i)	While carrying out this survey, use both horizontal and vertical angle measurements and target height to obtain x, y and z co-ordinates of terrain points.

(ii)	Detailed topographic survey shall be carried out for a distance of at least 100m on either side of the proposed one or more alignments (for the stretches where it is proposed to deviate from the existing alignment). During this process, all natural and man-made details shall be picked up along with their spot levels at a spacing of about 20m or less as required to represent the ground topography truthfully, or as directed by the Engineer-in-charge.
(iii)	Necessary jungle clearance for proper survey of the work, wherever required, shall have to be done by the Consultant
(iv)	For the stretches where it is proposed to deviate from the tentative alignment already decided, strip contour maps on a scale of 1:1000 have to be prepared and on that alignment has to be proposed at site. Before final staking of the proposed alignment, the same shall be got approved by the Engineer-in-charge. This map, in original, shall also be submitted by the Consultant to the Engineer-in-charge, on completion of the staking for that stretch.
(v)	Features such as ridges, cliffs, river banks etc., would be defined as an item (or string) each; similarly man-made features such as roads, Railway lines etc., with each item (or string) defining a visible feature such as a center-line, kerb of a road, berm, top and toe of embankment, OHE mast/portal etc. Due care must be taken to clearly identify one item (or string) from another in the item file. The aim is to collect the most useful information with the fewest points. This means planning items (or strings) along strategic features of the ground surface, where they exist.
(vi)	Wherever topography is suggestive of alternative alignment / alignments, (thickly populated locations) the Consultant will have to cover such alternative alignment / alignments in such stretches to enable Railway to take decision on the basis of their relative merits. In arriving at decision on the waterway, the Consultant should pay due regard to these works and consider the alternative of altering or diverting the bunds, irrigation channels etc., even it would mean incurring some expenditure on such alterations, if that would save a large expenditure on the waterway.
(vii)	The Consultant shall ensure that details in required MOSS format are furnished on pen drive, duly checked and verified and direct downloaded field data of Total Station in specified format supported with neat sketches (not to scale).
(viii)	Plot the center line of the proposed alignment along with all the existing features and obstructions, if any (scale: 1:1000). Also plot the longitudinal section to help Railway to confirm/modify decide the final formation level. Work out degrees of curves and details of gradients. The design of the alignment shall be done using Mx Rail/Bentley software in consultation with Railway.

(ix)	On these plans and longitudinal sections, plotted on Auto-CAD Latest version, carry out the detailed exercise of planning of curves and gradients
(x)	During this exercise, due care shall be taken of various provisions of the Railway Engineering Code for the Engineering Department and other relevant provisions.
(xi)	Topographic survey of rivers/ nallahs en-route shall be carried out in terms of paras <u>224 to 228</u> of the Engineering Code.
(xii)	Topographic survey of station sites en-route shall be carried out in terms of paras <u>231 to 233</u> of the Engineering Code.
(xiii)	Details regarding bunds, bunded streams and irrigation works in the vicinity of the line should be collected since these might affect the future safety of the line. Information regarding this should be compiled and furnished by the Consultant.
(xiv)	During the survey, careful notes with dates should be made on the ground, from personal enquiry and observations regarding any information likely to be useful in working out the details of the project.
(xv)	The Consultant should also note down and supply the details of all electrical overhead crossings (low & high tension wires) and communication lines, other wired crossings along the stacked alignments of proposed route / routes. The details shall include the vertical clearance of the lowest wire from the ground level, distances of the supports on either side from the center of the proposed alignment as well as voltage of the transmission line. Similarly details of OHE mast/portal & other structures of existing BG lines falling in the vicinity/infringing the proposed lines be noted and details supplied.
(xvi)	The Consultant shall also do detailed topographical survey to the scale of 1:1000 of existing stations, junction stations along the alignment of a strip of country 100m on each side of the centre line or upto railway boundary as the case may be and of rivers requiring a provision of water way of 110sq.m or upwards. Particular care should be taken in determining the boundaries of village land in entering on the plans any other details required for the preparation of land plans, if land acquisition is required.
(xvii)	The boundaries of different kinds of cultivated, forest, pasture, waste etc should also be collected during topographical survey along the proposed route. A rate for different kinds of land is also to be collected from the local authorities by the Consultant.
(xviii)	Wherever there is any doubt about any part of the survey, the relevant provisions of the Railway Engineering Code for the Engineering Department as modified from time to time shall generally govern.

(xix)	The data on nature of terrain viz., sandy, stony/rocky, vegetation etc., and type of ground shall also be recorded along with the chainages of change point.
(xx)	<u>Station Yards:</u> The Consultant shall collect all relevant data of existing/proposed station yards in the sections proposed like lengths of various lines, type of turn outs, sand humps, derailling switches, platforms, crossovers, their chainages, sizes and locations of various service buildings, OHE & S&T installation structures, FOBs, ROB's etc., by conducting a traverse and physical measurement at site and prepare existing yard plans based on this data duly showing the proposed additions & alterations for the junction stations and prepare a new yard plans for the remaining stations. (for details refer para 468-472 of Engineering Code 1999)
(xxi)	<u>Filling materials for embankment:</u> Borrow area is to be selected for use of filling material as per RDSO Guidelines and Specifications for Design and Formation for Heavy Axle Load (25 T) in embankment all along the alignment with minimum lead.
(xxii)	Any other site details, hydraulic data of rivers and streams, road crossings, details of bridges/ROBs/RUBs/FOB's/LC's.
3	<u>Staking of final alignment</u>
(i)	After preparing detailed topographical maps say 5-10 km or staking of the centre line of the finally proposed alignment should be taken up For fixing the centre line of alignment, <u>wooden pegs of size 5cmx5cmx30cm shall be used at 20m intervals and pegs of size 10cmx10cmx40cm at 100m intervals. Wooden pegs can be of any hard wood.</u>
(ii)	(a) Square M20 grade concrete pillars of size 150x150x900 mm as per approved drawing shall be fixed at every 500m along the alignment at the locations wherever there is change from the existing alignment and at all change points of alignment and at all important bridges and at the junction of ST, TC, Crown, CT and TS i.e., Beginning of Transition Curve (ST), Transition to Curve (TC), Curve to Transition (CT), Crown and at Transition to Straight and at the intersection points (apex points) of tangents of curves. The chainage and direction of alignment shall be clearly marked on the concrete pillars in paint. All concrete work shall confirm to grade <u>M-20</u> of IS 456. (b) Where the changed alignment is remaining within the existing track and it is not possible to fix the pegs and pillars as specified above reference pegs & pillars are to be provided at a distance of 2.5m away from the proposed centre line or as directed by Engineer.

(iv)	The survey operations should be sufficiently comprehensive to secure the information necessary for the preparation of the detailed plans and sections required under paragraph <u>443</u> of Indian Railways code for Engineering Department, 1999.
(v)	While fixing the alignment of Railway, instruction contained in para <u>214 to 233</u> of Indian Railways code for Engineering Department, 1999 with up-to-date correction slips/modifications made should be followed by the Consultant.
(iv)	Detailed study may be made for each curve and coordinates may be worked out every 20m and tabulated.
4	<u>Levelling work: X-section, L-section and fixing of TBMs. & Fixing of Pillars</u>
(i)	The alignment shall generally follow the existing alignment or modified alignment as suggested in DPR issued to the consultant and the same to be modified as per site conditions with alternatives, if need arises in order to comply with terms of reference, duly obtaining the approval of Railway.
(ii)	The traversing teams will fix <u>wooden pegs</u> at instrument stations and at salient points along the alignment. The <u>wooden pegs</u> shall then be replaced with concrete pillars of indicated sizes at important instrument stations and as already specified above.
(iii)	The Consultant will be required to carry out leveling work with reference to nearest Survey of India's benchmarks. He will carry these levels to the instrument station points and to pegs left at every 20m interval along the alignment by Traversing Teams. In addition, he will record ground levels along the alignment at every 20m interval in the longitudinal direction and cross sections at every 20m along the alignment at 5m (approx.) interval in lateral direction up to a minimum distance up to Railway boundary on one side of proposed alignment and upto central line of existing track. In case topography of the site demands closer intervals for proper depiction of longitudinal and cross profiles, the Consultant as per decision of the Engineer-in-charge shall also carry out the same. No extra payment will be made for this. The Consultant is also required to carry out leveling in isolated ponds or water logged areas or in the existing borrow pits filled with water.
(iv)	The Consultant will carry the level of existing GTS bench marks and fix new permanent bench marks at important and safe locations (where they cannot be disturbed) such as bridge approaches, temples, etc. at an interval of not more than 500m and at important crossings like road crossings, canal crossings, river crossings, station sites etc. along the alignment at a lateral distance as decided by Engineer-in-Charge. If permanent structures etc. are not available in this corridor, these benchmarks shall be left on permanent

	pillars erected for the purpose, of sizes as specified. The level taken enroute shall be checked across with other GTS benchmarks available in the project area to find out the accuracy attained. Permanent benchmarks also should be identified along the alignment at suitable intervals for future reference and a list of all such permanent benchmarks is to be annexed in the report.
(v)	In case of river/important nallah crossings requiring a water way of 110sqm or more, the Consultant will be required to prepare plan and cross sections after collection of relevant data as per provisions of para 467 of Engineering Code, 1999. He will also record 3 cross sections on the upstream of the proposed or existing bridge and 2 cross sections on the downstream or as directed by the Engineer-in-charge. The river/important nallah cross sections will extend from bank to bank. The interval and locations of such cross sections will be decided by the Engineer-in-charge. Information regarding direction of flow, HFL, other hydrographic details, presence of control structures etc. on upstream and downstream sides etc. are to be collected from reliable local sources/government authorities. No extra payment will be made on this account.
(vi)	In case, stagnant or running water is met in the river-bed for a depth more than 1m, a boat may be hired for leveling work. But the accuracy of work should not be sacrificed. No extra payment will be made on this account.
(vii)	The Consultant is required to assess the discharge and HFL for the streams of all Major Bridges using synthetic Hydrograph and as per IRS-Substructure Code & RDSO guidelines.
(viii)	The Consultant will connect new permanent benchmarks and other references established by him with the traverse left by Traversing Teams with the help of Total Station. In addition, he will compile and supply detailed sketches, list of benchmarks, their descriptions, identification numbers, northing, easting and elevation (above Mean Sea Level) with reference to the traverse of Traversing Teams.
(ix)	Necessary jungle clearance for proper execution of the work, wherever required, shall have to be done by the Consultant at no extra cost.
(x)	All leveling work along the alignment i.e. levels at every 20m intervals and connection to instrument station points left by Traversing Teams as well as establishment of new permanent bench marks shall be done by using Auto levels with an accuracy of $6\sqrt{K}$ mm, where K is the circuit length in Kilometer. Each day's work shall be closed at the same benchmark from where the leveling was started.
(xi)	Leveling work across the alignment for taking cross sections shall also be done with the help of Auto Leveling instruments.

5	<u>Concrete Pillars / Blocks:</u>
(i)	All concrete pillars used for fixing the alignment shall be pre-cast with concrete of M-25 grade conforming to the strength, durability and other criteria as per IS 456 and as per approved drawings. For casting the concrete pillars, OPC/PPC cement of 43/53 grade shall be used with graded hard stone coarse aggregate of maximum size 20mm and coarse sand conforming to IS Specifications. All pillars shall be of 90 cm in height with 45 cm length fixed firmly below ground level and 45 cm projecting above ground level. The exposed surfaces of pillars should be smooth and neatly finished with cement slurry. These surfaces shall be painted with first quality enamel paint of colour as specified by the Engineer-in-charge. The precast concrete pillars should be fixed firmly in the ground with proper ramming, etc.
(ii)	Reference pillars for ST, Crown, and TS: Four reference pillars, two on either side of the alignment, shall be fixed for each ST, Crown & TS of a curve, where it is proposed to ease the existing curves or provide longer transitions as per terms of reference. The traverse teams with the help of wooden pegs will specify their locations. These pillars shall be of pre-cast concrete (M 25) of size 150x150x900 mm and shall be fixed firmly in the ground and also be painted with details of curves as decided by the Engineer-in-charge.
(iii)	Reference Pillars for Bridges, stations: Reference pillars of 150x150x900 mm size shall be erected and packed with earth to indicate locations and extents of bridges, tunnels and station sites, i.e. 1 pillar each on either end and one at the centre or as indicated by the Engineer-in-charge. The pillars shall also be painted suitably with relevant details as specified by Engineer-in-charge
(iv)	<u>Providing bench marks:</u> Bench marks shall be established at not more than 500m intervals along the alignment and at all major / important bridges and road crossings. The locations for fixing the bench marks shall be so chosen that they can be conveniently referred during construction but yet are not liable for disturbance during the progress of work. Bench marks shall be marked on permanent structures available along the alignment. Where it is not possible to locate on permanent structures, bench marks shall be located on concrete pedestals of size 30x30x90cm as per approved drawing at a suitable distance from the proposed alignment. The exposed surfaces of these pillars shall also be duly painted with first quality enamel paint and painted with details of elevation etc. as decided by the Engineer-in-charge. The locations of all the bench marks and their values shall be indicated in the relevant drawings and an abstract shall also be furnished separately. Bench marks shall be of such a character and construction so as not to be easily disturbed / moved or dislocated by accident or mischief.

6	<u>Land Acquisition Details and Forest clearances:</u>
	The Consultant is required to draw the alignment to scale wherever necessary on village maps and the quantum of land to be acquired along with the details of Survey number etc. to be summarized on the village plan. The summary of entire data to be placed in the report. Similar exercise to be performed for forest land and the details should be summarized in the reports.. Land plan land schedule for private/government/forest land are to be prepared through joint field verification with State Revenue officials, Railway officials, Record of Rights to be collected from Revenue authorities and necessary assistance and follow-up action to be provided by the Consultant to expedite completion of land acquisition. Railway will render assistance in regard to co-ordination with the concerned Govt.
7	<u>Documentation</u>
(i)	Railway will provide existing details such as index plan, index section, Bridges details, station drawings etc.
(ii)	The Consultant shall prepare and hand over all original field and techno books, neatly maintained and duly indexed.
(iii)	The Consultant shall provide electronic file in <u>MS-EXCEL 7.0</u> or similar software of all field data. The Engineer will give the required format at site and the Consultant shall provide direct unloaded field data of TOTAL STATION in specified format.
(iv)	The Consultant shall submit to the Engineer point and item files in the format specified as well as northing, easting and elevation of all the observations, direct unloaded field data of TOTAL STATION in specified format. He will also plot and submit the topographical plan along with proposal for the proposed quadrupling BG line in accordance with the requirements of the Terms of Reference for approval. The staking of the centerline of the proposed BG quadrupling alignment shall be done only after approval to this proposal. On completion of the staking, detailed plan (scale-1: 5000) and L-section (scale-1: 5000 hor.&1:500 ver.) shall be prepared by the Consultant as per Indian Railways Code for the Engineering Department.
(v)	A report shall be submitted by the Consultant describing, progressively, on topography of the area, land use pattern, terrain details, potentially unstable conditions, waterlogged areas, areas of unstable soil types, marshy areas etc. All such areas shall be identified in the report with respect to chainages. This report shall also give listings of various curves, gradients, bridges, tunnels, station yards etc. in terms of the Engineering Code.
(vi)	Metric units shall be used in all drawings and reports.

(vii)	The entire data and report shall be submitted in MS-EXCEL (Rel.7.0 or later) and MS-Word (Rel.7.0 or later) respectively, duly formatted.
(viii)	A Weekly progress report in the enclosed proforma shall be sent by the team leader of each team by Fax so as to reach Railway Office every Monday, positively.
8	<u>Abstract of gradients, curves and bridges:</u> The Consultant shall furnish the details of gradients and curves to be provided on the final alignment for the stretches where it is proposed to deviate from the existing alignment. He shall also furnish an abstract of bridges duly indicating their chainage, bed levels etc on the proposed line for the stretches where it is proposed to deviate from the existing alignment in case of Doublings and GC.
9	<u>Jungle clearance:</u>
	The rates quoted by the Consultant are inclusive of jungle clearance required, if any, for conducting the survey including fixing of pegs, pillars etc and no separate payment shall be made.
10	<u>Bridges and grade separators:</u> The scope of work does include submission of discharge calculations in the case of all bridges across streams/rivers/channels. However, all relevant site details in the case of all road crossings, such as type of road, angle of road crossing should be taken to prepare plan and section of road at least for 500m on each side of proposed crossing etc., required for deciding the type of grade separator RUB/ROB and incorporated in the plans.
11	In case Railway decides to shift an existing road, level crossing, a nallah/water course / stream etc., as per the exigencies at site in due course of surveying, the Consultant shall undertake such additional work within his quoted rates and nothing extra shall be paid.
12	<u>Site Facilities:</u>
	The consultant is advised to acquaint themselves well with the site conditions, availability of approach roads etc before quoting their rates. The rates quoted by the Consultant are deemed to include charges for any and all site facilities that are considered necessary for the execution of work. Land that can be made conveniently spared near two end stations will be made available by East Central Railway free of charges for the use of the Consultant for his field offices, stores, depots, workshops and temporary accommodation of his staff. The Consultant shall visit the site, see the extent of land available. No assurance can be given regarding the vulnerability of such land to flooding or any other calamities. On completion of work, the Consultant shall remove all temporary structures at his own cost and hand over the vacant land to East Central Railway, within one month. If East Central Railway is unable to spare

	sufficient land to meet the Consultant's requirement, he shall make his own arrangements for the same, at his cost.
13	<u>Service Roads:</u> The Consultant will be permitted to make use of the existing service roads, if any, free of cost. New service roads required by the Consultant in connection with the execution of work either near the work site or elsewhere within or outside Railway limit for carriage of men, materials or for any other purpose whatsoever will have to be constructed and maintained by the Consultant at his cost. For the purpose of construction of service roads on Railway land, permission will be given to the Consultant at Railway's discretion free of any charges.
14	<u>Land:</u> Land other than Railway land is necessary to be entered upon for the purpose, such permission to enter into the land shall be arranged by the Consultant at his cost. The Consultant shall indemnify Railway against all claims for all damages whatsoever on this account.
15	<u>Electric Power:</u> The Consultant shall make his own arrangements for obtaining the electric power required for operating his machinery, equipment, lighting etc.
16	<u>Safe working methods:</u>
(i)	The work is required to be carried out in the vicinity of running Track and Bridges in case of doubling projects, and the Consultant shall take all necessary measures required to ensure safety of both his men/equipment and railway assets/ running trains at all times and the rates quoted by him shall include the cost of all such measures. If at any time, Railway finds that the safety arrangements are inadequate, the Consultant shall take immediate corrective measures at his cost. Any dereliction in the matter shall in no absolve the Consultant of his sole responsibility to adopt safe working methods.
(ii)	The Consultant shall take adequate precautions for the safety of his staff when they have to work in close proximity to the running Railway lines and ensure safety of running traffic and his staff at all times. All expenditure for ensuring the above shall be borne by the Consultant and the rates quoted by him shall include the same.
(iii)	The Consultant shall remain fully responsible for ensuring safety and in case of any accident, that is attributable to the Consultant or any of his staff as determined by competent authority from Railway, the Consultant shall bear the cost of all damages to his equipment, men and also damages to Railways and its passengers.
(iv)	The Consultant shall at all times be responsible for any damage or trespasses committed by his agent or his staff while carrying out the work. Railway will not be liable for any damage caused by the Consultant, his agent or his staff to

	any property whether that of Railways or of an outsider during the execution or arising out of the work entrusted to him.
(v)	Inflammable materials such as petrol, kerosene, diesel etc., shall be stored with necessary precautions to prevent fire accidents. The extant rules as prescribed by the Government / local authorities shall be observed by the Consultant at all times during the execution of work.
17	<u>Methodology of work:</u>
17.1	The Consultant shall adopt the following methodology for carrying out the Final Location Survey work under this tender:
17.2	Confirmatory Final Location Survey:
	<u>Step I:</u>
	In Step I the Consultant shall run a traverse as close as possible to the proposed alignment and In case of doubling projects collect the existing site details and verify the authenticity of data given in available records and duly taking into account the constraints like safety of running traffic, the need for traffic blocks etc, on account of working close to running lines during construction, he shall prepare proposals for extension of bridges/constructions of new bridges on diverted alignment keeping in view the methodology to be adopted for construction. The Consultant shall furnish a comprehensive report to Railway clearly bringing out all such modifications and deviations from the existing alignment with specific recommendations and obtain the approval of Railway. Bench Marks shall be established at approximately 500m intervals on permanent structures / special TBM pillars erected for this purpose and connect all of them from the nearest GTS benchmarks by check leveling.
	<u>Step II:</u>
	In Step II the Consultant shall transfer the alignment finalized on paper during the first phase, onto the ground, duly fixing pegs, planting pillars, TBMs etc. and take the longitudinal as well as cross sectional levels and conduct visual soil investigation and classify the soils.
	The Consultant shall take precise levels along the straight and curved alignment, including the levels of nallas, cross section of bridges as necessary and preparing and supplying L sections showing the details of existing and proposed rail levels, existing ground levels, bed levels, HFL of streams, FLS of canals, level crossings, bridges and other structures and showing the details of proposed crossing (grade Separators), crossing and halt stations. Other works under Phase-II include (a) Supplying and fixing concrete pillars of

	specified sizes (b) making trial pits/trial bores including identification and classification of soil/rock strata as per relevant IS code and (c) furnishing site details and preparation of proposals of all major & minor bridges, road over & road under bridges, level crossing, foot over bridges, HT/LT/Power/Communication line crossings. <u>Step III:</u>
	In Step III the Consultant shall complete all other items of work included in the scope of the tender and furnish all documents as mentioned in para of Scope of work and the final report.
17.3	PERFORMANCE
	Notwithstanding any review of its organization structure, staff or manning schedules, the Consultant shall remain wholly responsible for providing the services. If, in the opinion of the Employer, the progress or performance of the Consultant's work is seen to be at any time inadequate to meet those requirements, the Consultant shall take the necessary steps to improve them on being so notified. If within a reasonable period the Consultant has not improved its progress or performance Railway may by written notice require it to take additional measures, including changes in its organization, at no additional cost to Railway. Such notice shall be in no way deemed to constitute a waiver of Railways rights to terminate the Agreement by reason of the Consultant's breach of contract. Failure by the Railway to issue such a notice shall not relieve the Consultant of its obligation to achieve the required rate of progress and quality of work.
17.4	STANDARD OF SERVICES
	The Consultant shall be responsible for the correctness and technical merit of its design, calculations, drawings and all other documentation prepared by it in carrying out the services. The Consultant shall ensure that qualified and experienced staff is deployed in sufficient number and those accurate, consistent, clear and easily readable drawings and documents are produced in time. The Consultant shall comply with the provisions and procedures covering standards and codes and drawings.
17.5	STANDARDS AND CODES
	The standards and codes as appropriate shall be used in Consultant's design, and where appropriate, shall be quoted on drawings and other documents by Consultant. Normally, the Consultant shall use Indian Railway Standards in its design requirements in preference to other national standards. Should the Consultant propose to adopt other standards or codes for its design, documentation etc., it shall submit to the Employer copies thereof. The Consultant shall also demonstrate that other standards are equivalent or superior to those they intend to replace.

17.6	EXTENT OF INFORMATION
	All designs, drawings and documentation produced by the Consultant shall provide sufficient information and detail for Consultant to determine accurately the extent of the works, submit firm prices and during construction, execute and maintain the works. All the drawings & design, Specifications and other information produced by the Consultant shall be submitted to Railway, in sufficient time for review and finally to be got approved from the Railway as required.
17.7	DRAWINGS
	All drawings and design including preliminary Drawings, Working Drawings etc. shall be prepared and submitted by the Consultant in accordance with the requirements of Railway. Documents produced by the Consultant shall be listed as part of the Progress Register. Periodic Progress Reports will be provided by Consultant and where necessary, the Consultant will attend periodic progress meetings. The meeting will discuss the project status and any open or unresolved technical or contractual issues.
17.8	SUBMISSION OF ORIGINALS
	The submission of originals shall be made to Railway. This will consist of all documents prepared by the Consultant.
17.9	DELIVERY OF DOCUMENTS
	After Railway has accepted the submission of the Originals, the Consultant shall deliver in electronic format on CDs/Pen-drives, all Documents prepared by it to MRVC. The original documents, typed but not bound, shall have been proof read, reviewed, approved and certified, and be ready for reproduction. The Consultant shall furnish a complete set of CDs/Pen-drives to Railway, prepared in accordance with requirements within 15 days of the submission of the original drawings. Detailed and Final Drawings shall be submitted in 3 hard copies along with good quality (double matt film 75 micron) original tracing and two soft copies on CDs/Pen-drives.
17.10	SUBMISSION OF DOCUMENTS
	The Consultant shall deliver the drawings and documents as listed to Railway and packaged as directed by Railway.
18	<u>Technical specification for - Carrying out plate load test and Soil exploration.</u> The work will be carried out at various locations as directed by Engineer-in-charge. The works will interalia include conducting the exploration bore, collecting samples, conducting field and laboratory test etc. and

	submission of these in a report form. Exploration/Experimental Bores shall be minimum 100 mm dia. The scope of work is Taking trial bore of 100mm dia in all strata without core including use of casing pipe during boring including transporting and platform etc. complete and Taking trial bores of 7.62 cm (3") dia for 5.08 cm (2 1/8") core in hard rock (except quartzite) by diamond drilling machine with "NX" bit by Joy 12 B or Joy 7 or similar type of hydraulic rig machine including preservation of cores in standard core boxes (including cost of core boxes) depth 0 mts to 32 mts from ground as per the latest relevant IS code and Railways manuals and as directed by the Engineer in charge. The consultant may have to use pontoons/jacking platforms for carrying out bores in rivers/streams of running water like locations of important bridges at Vaitarna and other major bridges. The rates include the extra expense of pontoons/jacking platforms for boring at such locations. The rate also includes all taxes, leads, lifts, labours, transportations, royalties etc complete, nothing extra shall be paid other than the rates accepted. SOIL EXPLORATION. Experimental bore with minimum 100 mm dia. Casing pipe will be conducted up to a depth as specified in schedule in all types of soil. Depth of experimental works can be further increased in exceptional cases beyond specified depth in schedule, if considered necessary at site by Engineer-in-charge. Payment for extra depth of testing will be made at proportionate rate desired per RM for each item rate. The hole shall be laid out as directed and as per technical requirements instructed by Engineer-in-charge. The undisturbed samples shall be collected in walled sample as per IS 2132-1986 at every change of strata but not at a interval more than 1.5 m. The undisturbed sample collected shall be tested for shear parameters, field density, field moisture content etc. as per relevant IS code. Shear parameters shall be for different condition depending on type of soil and field condition as per relevant IS codal provision. The disturbed samples from standard penetration test shall be collected at every change of strata but at a interval not more than 1.5m in accordance with IS:2131-1981 using standard split spoon sampler and hammer of 65 Kg. Through a fall of 75 cm. Samples taken shall be tested for Grain size (with IS classification) and Atterberg's limits (liquid limit, plastic limit compression index) specific gravity, chemical properties (IS: 2720) consolidation properties (IS: 2720) etc. as per relevant IS code. Determination of CBR and testing of Rock Samples is to be carried out as per IS: 2720 and report is to be produced/submitted to engineer in- charge.
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19	RECORD. A continuous record of sampling procedure to be maintained and samples are to be labeled with numbers serially. - From top to bottom each bores - With the depth from which samples was taken - Description of materials constituting the samples. - Labels will also identity the project and the date of taking samples. - Record of ground water shall be kept for each bore hole. - Casting shall be raised at the completion of drilling. - Water reading may be made after 24 hours in at least one bore hole as specified by Engineer-in-charge. - Observation of inflow or loss of water from boring during drilling shall be recorded. A bore log will include all the information specified as above and appropriate to each label of the boring entered beside a column scaled to represent the depth. Each log sheet shall contain:- - All details as taken above the name of company and his engineer during the drilling. - The designation by number of latter of the test boring involved. - The size and fall of the weight used in drilling casting as well as in the SPT. - The boring log shall be keyed to a map or a plot plan showing the location and designation of the test boring - The period within which the boring were made and testing the meaning of any symbol which needed to interpret the data on the map. - The safe load carrying capacity of a raft of width 10m at a depth 3 M shall also be submitted with calculation (Based on relevant IS codes) Every 10 m depth of boring shall be got certified from Railways representative. Two sets of final report shall be submitted in addition to the interim report. Following IS Code shall be followed with latest amendment: - IS -1092 - IS-2720 part – I to part XXXIX - Any other relevant IS Code. - The contractor will ensure that record of observations during un-disturbed sampling of soils and SPT test will be maintained as per IS code. - The contractor will ensure that casing shall not be driven into the layer to be tested and sampled in advance of the penetration and sampling operation. - The contractor will ensure that complete ground water information are indicted in the observation sheet - The testing should be got done in approved laboratory.
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5	SPT test for soil/rock strata shall be done at every 1.50 m interval or at change of strata.
6	The contractor will make his own arrangement for carting all materials and tools required for the successful completion of the work in time.
7	When the work is required to be done along or near the existing Railway track the contractor shall take all steps as are necessary for the safety of the track and labour working at site. He will also be required to programme his working so as not to interfere with the movement of trains. No extra payment shall be allowed for these precautions and also for crossing of tracks, if required during the execution of the work. The contractor shall be fully responsible for any damage caused for trespass caused to by his men to any surrounding structure and Railway bears no liability what so ever on this account.
8	The rate includes all labour, tools and plants and material etc. complete.
9	Contractor has to make 16 gauge steel boxes with covering for the soil/rocks samples in log form. The size of boxes shall be 100 cms x 40 cms x 10 cms. The soil sample shall be kept at various sampling depths in chronological order in polythene boxes with description of the strata and in case of rock continues rock samples to be preserved with RL written in the side of the boxes with paint. Nothing extra shall be payable on these account.
10	The contractor has to give advance programme to the Engineer in charge so that railway representative during the boring and soil exploration can be deputed at site of work.
11	The trial bores are required to be made in the alignment of proposed Railway Bridge. The site location and the bore will be approximately on each abutment and piers of important and major bridges and at locations of each minor bridge. The trial bores are also required at every 200m – 300m along the proposed formation alignment where strata is uniform or even at more closer intervals as directed by Engineer incharge at every change of strata, as per provision of GE-G-1:2003 issued by RDSO.
12	The contractor has to transport and handover all the steel boxes containing the samples to the Site Engineer of Railway and then only final payments to the contractor will be released. Nothing extra will be payable on this account.
13	The work includes boring in all types of soil including weathered rock strata excluding hard rock under item No. NS/1(a) and boring work in hard rock strata(RQD >50) under item NS/1(c) and shall be payable accordingly.
14	It will be incumbent on the Railway to carry out all the tests specified and the Railway administration may decide at his discretion for not carrying out any or some of the test mentioned in this schedule. The decision of the Railway Engineer in this regard will be final.
15	The bore test result for each bore shall be submitted to Railway within one week of the completion of the work.
16	The contractor will provide all the facilities to the representative

	of the Railway, for correct recording of the date of the sample boring at various depths where change of soil takes place. GENERAL 1.1 The report shall be submitted within the week of completion of the bore. 1.2 Contractor shall supply all labours materials and equipments to complete the work as outlined above. The Index Plan, & Section The Index- Plan,& Section should show the formation, level by a red line; the gradients should be figured and the height of formation above Mean Sea Level entered at each change of Gradient The position of each, major bridge with the name of river and number and size of bridge spans should be indicated, also level crossings with their classification "as special" "A", "B" "C" or "D" class and position of each station with its name and distance from the "fixed point". The kilometrege from the "fixed point" should be marked and figured at every kilometre. Contractor has to submit the Check Prints on White Papers and after finalizing and sanction of the Check prints, Original tracing shall be prepared on the 75 microns double mate tracing film of approved quality. After sanction of competent authority, contractor shall submit Six ammonia copies duly coloured for each along with soft copies.
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3.2 ELECTRICAL WORKS:

The scope of work includes all required information's/drawings for electrical works of the project. *Requirements not specifically specified in this scope of work but required, shall be deemed to be included in scope of work.*

1. SCOPE OF WORK

(A) Terms of Reference (Electrical and OHE)

The salient features for Electrical and OHE will be provided in Detailed Project Report (DPR) of the concerned project copy of which will be given to the shortlisted consultant

- (i) Survey of existing electrical power supply system of the railway in the project section and identification of augmentation/modification works to be carried out indicating augmentation of existing power connections and availing new power connections from the supply authority. Approval of railway to be obtained to the system suggested by the Consultant.
- (ii) Electrification of all service buildings, staff quarters, service roads etc. being constructed under the project.
- (iii) Watering arrangements with Electric pumps for water supply.
- (iv) Air-conditioning of remote control centre and service buildings as per existing instructions of Railway Board and as per site requirement.
- (v) Survey of overhead/underground and lines running parallel to track on both sides of power line crossings in the project section using "Total Station" or similar equipment and preparation of report.
- (vi) Provision of home lighting system in quarters and offices.
- (vii) Electrification of platforms, yards, circulating area, approach road etc.
- (viii) Provision of battery charging and pre- cooling facilities on Platforms and yards etc.
- (ix) Foot by foot survey preparation and submission pegging plans infringements if any on the section needs dismantling/ modifications /alterations/ augmentation etc. This shall include all kinds of infringements related to OHE & GS in proposed alignment as per Indian Railway's Schedule of Dimensions for BG. Preparation of wiring cum section diagram and general power supply diagram.
- (x) Study of existing power supply arrangement of section and submission of report on availability of Traction power supply for augmentation of existing power supply and proposed TSS.
- (xi) Inspection and location plans indicating Rly / non rly land for augmentation of existing and proposed SP & SSP.
- (xii) Preparation of location plans indicating railway/non Rly land for augmentation of existing OHE cum PSI maintenance depot.

2. PREPARATION OF DRAWINGS

- (i) Specific schematic layout drawings for works to be executed under the project including indicating existing system.
- (ii) *Specific drawings for replacement of overhead power line crossings up to 33 KV with underground cable and above 33KV with overhead system.*
- (iii) *The Consultant shall submit all the drawings and other deliverables (Proposal Document, Estimate, reports etc) in 2 soft copies on CD and 3 hard copies, the cost of which shall be deemed to be included in the quoted rates.*
- (iii) *The drawings & designs submitted by the Consultant will become Railway's property and Railway will have the right to use them in other projects also. The Consultant is not permitted to use/issue/reproduce them in any form without the express approval of Railway.*
- (v) *The Consultant will make his own arrangement to procure any drawing/document from Railways/RDSO required for the assignment. The necessary reference letters etc. shall be provided by Railway.*
- (vi) *The Consultant shall prepare all drawings under this contract in Auto CAD software.*

NOTE: -All drawings and design including preliminary Drawings, Working Drawings etc. shall be prepared in standard sizes and submitted by the Consultant in accordance with the requirements of Railway.

3. PREPARATION OF SURVEY REPORT, DETAILED ESTIMATE AND PROPOSAL DOCUMENT:

The provision of following items should be also be included as per actual requirement at site:

- (a) Location of Electrical main/sub distribution boards/CLS panel in ASM Rooms.
- (b) Replacement of overhead power line x-ings up to and including 33 KV with cable through trench-less method and coordination with State Electricity Board for removal of overhead conductor and return of released material
- (c) Battery charging and pre-cooling facilities, if required
- (d) Internal wiring/lighting works and power supply arrangements for service buildings/staff quarters/platforms/streets/circulating area etc.
- (e) LT/HT modification works as per site requirement
- (f) Water Pumping stations wherever required
- (g) Street lighting
- (h) Emergency lighting arrangements from CLS supply point in station areas for booking office, Foot over Bridge (FOB), ASM room & Platform etc.
- (i) Air conditioning of S&T installations in line with extent instructions of Railway Board.
- (j) Yard lighting arrangements.
- (k) Stabling lines
- (l) Escalation/elevator to be provided at stations
- (m) Fire fighting
- (n) Carshed augmentation whenever required.
- (o) DG sets wherever required

- (p) Energy conservation system like solar energy system, LED based system
- (q) Assessment of shifting of electrical utilities for infringement removal
- (r) Illumination calculation based on requirement including requirement of GS Substation- design and site location, equipment location, single line diagram, augmentation of power supply etc.

(B) Railway Electrification Works

- (i) Reports of soil investigations/SPT up to the depth of 3 meter, for the purpose of OHE foundation designs at every 5 Km distance or change of strata, based on Geotechnical investigation carried out for civil engineering work to be submitted.
- (ii) Safe bearing capacity for various structures viz., service buildings, staff quarters, TSSs, SP/SSPs, OHE/PSI depots, Trip shed and overhead tanks etc.
- (iii) Design for provision of RE masts on bridge piers and its Foundation and Approval from Railway.
- (iv) The quantity assessment for each installation separately and then combined together for obtaining total quantities.
- (v) The requirement of drawings furnished above is only indicative and not exhaustive. Any additional drawings considered necessary shall be prepared by the Consultant as per the directions of the Employer.
- (vii) The Bidder shall submit all the drawings and other deliverables (Geo-technical investigation reports etc.) in RTF, **2** soft copy on CD and **3** hard copies,
- (viii) The drawings & designs submitted by the Consultant will become Railway's property and Railway will have the right to use them in other projects also. The Consultant is not permitted to use/issue/reproduce them in any form without the express approval of Railway.
- (ix) The Bidder shall use standard Railway/RDSO/CORE drawings in his design, barring the exceptions (with specific approval of Railway) Standard drawings, if required by Railway will be arranged by the Consultant.
- (x) The Consultant will make his own arrangement to procure any drawing/document from Railways/RDSO/CORE required for the assignment. The necessary reference letters etc. shall be provided by Railway.
- (xi) The Consultant shall prepare all drawings under this contract in Auto CAD software.

NOTES

- (i) *The estimation should take into account Railway's requirement identified through discussions with Railway/Electricity Board/DOT/Land Authority officials consultants own assessment and any other items essentially required for execution of project.*
- (ii) *The preparation of Proposal Document also involves preparation/updation of detailed estimate. For this purpose, the adopted rates should be based on Railway's latest Purchase Orders/Works Contracts. For those items whose rates are not available in Railway, accepted rates of other government organizations could be adopted after consultation with Railway. Rate analysis may be done for those items for which no basis of rates is available. Copies of work orders/purchase orders/price lists etc. used in preparing the priced BOQ shall be furnished to Railway.*

METHODOLOGY OF WORK

The work involves foot-by-foot survey of the section proposed for electrification for collection of site details, for mapping existing arrangements etc.

The works proposed in the scope involve site visit to get relevant details, visit to various sites/offices, Railway offices etc.

(C) Scope of Work For Pegging Plan

(I) General:

Foot by foot survey of the project section needs to be carried out for preparation of OHE pegging plans. The detailed scope of work is broadly categorized as under:

- (i) Collection of basic drawings, standards and specifications from Railway/RDSO/CORE in respect of electrification of the section.
- (ii) Preparation of tracings of track survey plans in AutoCAD and submission of two prints to Employer along with soft copy on CDs.
- (iii) Preparation of OHE Pre-pegging plans utilizing the tracings and track survey plans.
- (iv) Site marking/inspection of OHE Pre-pegging plans (jointly with Employer's representative if required).
- (v) Incorporation of corrections in the tracings and updating of CDs, if found necessary, to evolve pegging plans and submission of two prints thereof to the Employer for comments/approval.
- (vi) Finalizing the comments, incorporating changes if found necessary, in the tracings and soft copy to evolve final pegging plans, obtaining approval of Employer and thereafter submission of RTF/prints and soft copy.
- (vii) Preparation of wiring cum sectioning diagram followed by final pegging plans and submission of RTF two hard copies and one soft copy.
- (viii) The pegging plans shall also indicate details of removal of infringements such as diversion of drains, pipes, signal wire, rods or other installations, details of which shall be jointly finalized with the Employer.

(II) Assistance to be given by Employer:

The drawings and data shall be collected by the Bidder.

- a) through actual site survey
- b) from the Railway /CORE/RDSO at his own expense.

(III) Methodology for pegging plan:

- i) All measurements shall be made with steel tape. At curves, these measurements shall be made on the outer rail of the middle track, in case of odd number of tracks. In case of even number of tracks, the inner rail of the first outside track from the centre of the formation will be taken as the reference rail.
- ii) The following information shall be collected while carrying out of the field survey of the section, in respect of the tracks required to be wired and also all the tracks in their vicinity, to enable preparation of track survey plans and thereafter OHE pre-pegging/pegging plans.
 - a) Track centre distance at every 30 M in case of double and multiple tracks, in stations and yards, commencing from the kilometer post.
 - b) Chainage of the existing gradient posts and details of the gradient indicated thereof e.g. 1:100(R) and 1:200(F) etc.
 - c) Chainage of the existing curve pillars and the particulars as furnished thereof in respect of the curvatures e.g. degree of curvature, radius of curvature, length of

- curve, deflection angle, chainage of transition, turning points, super elevation etc. will be measured if available at site.
- d) Versine in every 30M chord on all curves for each individual track throughout the section.
 - e) Cross section of the formation at a regular interval of 200M, commencing at the kilometer posts, to indicate the ground profile. The ground profile will cover a distance of about 4/5M from the centre line of the track and will be measured with a tape, string and survey rod. The profile of the proposed double line shall also be plotted on the cross section as per the details made available in the Plan & L sections.
 - f) Type and bearing capacity of soil:
Reports of Soil investigation/SPT up to the depth of 3 meter, for the purpose of OHE foundation designs at every 5 Km distance or change of strata, based on Geotechnical investigation carried out for civil engineering work to be submitted.
 - g) The chainage of the edges, the width, number and class of the level crossing, dimensions relating to the position of gate lodge and the level crossing barrier with reference to the track.
 - h) The chainage of the centre line of all the existing trolley refuges.
 - i) The number of bridge/culvert, the chainages of both the abutments, centre line with/shape of the piers. Wherever structures are to be located on a bridge or inside a tunnel, the Consultant shall provide sufficient details. In case of structures located on piers, and inside tunnel, dimensions of space available, a cross section giving details of bridge member and in case of suspension from top or vertical members of bridge/tunnel, the cross section at the suspension/fixing points shall be shown, giving all relevant details with dimensions. The design of supporting arrangement and obtaining approval from Railways is also part of the contract.
 - j) The chainage of the both the edges, width and clear headroom available for each of the wired tracks under the over line structures e.g., Road Over Bridge(ROB, Foot Over Bridge(FOB), Fly Over Bridge /Via duct, Through Girder Bridges(TGB) etc. In respect of overhead electrical high tension (above 11 KV) crossings, chainage and clear head room shall be shown. In case of LT/P&T crossings only centre line chainage need to be provided.
 - k) All the underground obstructions, which may infringe with the casting of OHE foundations like watering arrangements, underground cables and pipes, shall be shown on the pegging plans. The details may be ascertained from the local Railway staff/office.
 - l) The chainage of the actual toe of the switch, the nose and the fouling mark for every turn out.
 - m) The chainage of the centre line of the diamond crossing, the number of slips and chainage of the actual toes of the switches.
 - n) The chainage, number and position of existing signals, with reference to adjacent tracks.
 - o) The distance of extreme edges of a group of point rods requiring adjustments / special arrangements for locating OHE structures over/near them, from the centre of the adjacent track/s at regular interval of 25M throughout the length of the run of point rods.
 - p) Position details/chainage of signal location boxes.
 - q) Chainage/Position details with reference to adjacent tracks in respect of all the building structures e.g., station building, cabins, cable huts goods and parcel sheds, tea and other vendor stalls, FOBs on platforms etc.

- r) Chainage of the edges of platforms ends and ends of ramps, height of the platforms and width in respect of island platform chainage of extreme edges of platform sheds is also to be mentioned.
- s) The distance of the near and far edges of pucca drains (requiring adjustment/special arrangements for location of the OHE structures near/over them) at a regular interval of 25M throughout the length of the run of drain from the centre of adjacent track/s.
- t) Position/Chainage of edges of sub-ways and their outlets on platforms.
- u) Relevant details of any other existing feature/s and obstruction/s, which will affect location of OHE, structure over/near the same i.e. 10M on either side of the track.

(IV) Track Survey Plans:

The following standards/conventions shall be observed for preparation of track survey plan tracings in ink on paper.

- a) Standard width of the tracing shall be 297 mm or multiple thereof.
- b) A scale of 1:1000 for open section and 1:500 for station/yard shall be adopted. The station/open section shall commence at the Km post immediately in advance of the first turnout from the main line and shall end at the Km post immediately after the last turnout from the main line.
- c) An arrow at the end of the plan will be provided to indicate the direction and name of the adjacent/extreme station in the section.
- d) Track shall be designated as UP/DN UP Loop / DN Loop etc., according to the standard convention.
- e) Normally the plotting shall begin at the Km post and end at the Km post. The length covered will not be more than 3 Km in one plan. Only one single plan shall be prepared to cover the entire length of station section from Km post at one end to the Km post at the other end. However, in case of very big yards, convenient subdivision shall be made and key plan showing the sub-division shall be prepared based on the relevant wiring plan.

V) Pre-Pegging Plans:

- a) For structures in the vicinity of signals, setting distance shall be as per RDSO standards.
- b) The setting distance of OHE structure on tangent track shall be 2.8 M at normal locations and 3.0 M for portal locations and masts carrying more than one OHE. On curved tracks, the minimum setting distance, is obtained by adding curve allowance and 150mm slewing allowance.
- c) The plan shall also indicate the location of Auxiliary Transformers proposed at manned level crossing gates and at stations.
- d) On each plan the length of track in RKM and track electrified/to be electrified with conventional OHE in TKM covered in the plan shall be indicated.

VI) Pegging Plans:

The plan after incorporating the observations, corrections made during site inspection will be thoroughly scrutinized to eliminate all design/field survey errors/omissions and then only will be accepted as pegging plans and submitted to Employer for scrutiny, comments and approval. The pegging should contain all existing arrangement of OHE of all electrified lines including yards.

VII) Final Pegging Plan:

The consultant shall submit RTF, two hard copies and one softcopy on CDs containing the details of approved tracing.

VIII) Wiring cum Sectioning Diagram:

The sectioning diagram should be retraced/updated based on existing sectioning arrangement and final pegging plan and submit RTF, two hard copies and one soft copy on CDs to the Employer.

3.3 SIGNALLING AND TELECOMMUNICATION:

Salient features of S&T works will be as per detailed project report for the respective project copy of which will be provided to the shortlisted consultant.

This involves design and drawing of:

- a) Foot print and database of the existing signal and telecommunication system
- b) Signal infringement plans
- c) Telecom infringement plan
- d) Signaling Interlocking plans of stations, based upon proposed ESPs and showing Additions & Alterations on existing SIPs.
- e) Preparation/updation of detailed estimate

Preparation of footprint of signaling and telecommunication system at station includes:

- a) This involves collection of Signal Interlocking Plan and Station working Rules of the station to assess the existing signaling system at the station which includes existing gradient and restriction in the train working at the station.
- b) The orientation of the existing ASM room and the signal and telecom equipment installed inside the ASM's rooms with their sizes to assess their reusability for housing the equipment and ASM Panel/VDU. This will enable to assess any infringement of the existing structures with the proposed alignment of quadrupling.
- c) Orientation of the operating panel with respect to track and the direction should be clearly mentioned on the plan itself.
- d) Details of existing Power Supply System including DG sets installed also to be mentioned.
- e) The telecom room at the station and its location vis a vis existing structure at the station should be clearly mentioned to assess infringement if any.
- f) Details of signaling assets required for the project
- g) The details of assets include date of installation/commissioning of signaling and telecom assets at the station / interlocked LC gate. These will give an idea of the residual life of the equipment installed at the station / LC gate and their usability in doubling work. The data should be collected from authentic sources. Reference letter required for collection of data will be provided by the Railways.

Signal and Telecom Infringement Plans includes:

- a) Telecom Cables laid in the existing station & Block section includes Optic Fiber Cable and 6 quad cable from station to station. Emergency sockets are provided at every one kilometer in the section and at LC gates and ends of major bridges derived from 6 quad cable. Telecom cable is also laid from to all SP, FP and SSP from the nearest stations. EC sockets derived from 6 quad cables are provided at all these electrical installations.
- b) Signaling cables laid from distant to distant signal on either side of stations and interlocked level crossing gates.
- c) Signaling cables laid in the yard portion for operation of points, signals, track circuits, GF etc. These cables are terminated in the location boxes erected over a foundation on the cess.
- d) These underground buried cables are to be identified in the block section and the yard. These cables are to be marked to the scale on A3 size sheet in AutoCAD. The plan should indicate the centre line of the existing track, centre line of the proposed track, inner and outer toe line of the proposed track. OFC, 6 quad cable and the signaling cables and power cable, if any, to be marked separately with different legends. There may be multiple routes of signaling cables. All the routes should be marked separately. The signaling location boxes and telecom junction boxes to be marked clearly on the plan.
- e) All the signaling and telecom assets should be marked on the plan in such a

- way that infringement of these assets is clearly identified.
- The infringement zone of the underground cables extend 3 meters beyond the toe lines.
 - The plan should be made on A3 size sheet depicting infringement in 500metres.
 - Shifting of OFC and 6 quad cable falling in infringement zone should be planned for shifting while preparing the BOQ.
 - The LC gate buildings including Gate hut, relay room / power room falling should be shown on the plan to assess the infringement of structures, if any.

Signaling Interlocking plans of stations, LC gates includes:

- Preparation of Signaling Interlocking Plan (SIP) of the stations and Independent Interlocked LC gates in the section.
- SIP should be prepared in the format prevailing over East Central Railway, sample of which will be given.

Scope of work for preparation/updation of estimate includes:

- Schematic sketches of the signaling arrangements at stations is made for determining station wise scope. These should be made on A3 size sheet.
- Technical specifications have to be in conformity with the practice of the Zonal Railway.
- The work to be carried out with MACLS, Electronic Interlocking / PI / RRI, DC Track Circuits / axle counters, LED signals, Networked Data-logger, IPS with LMLA batteries and Block Proving by Axle counter, based upon updated Railway Board, RDSO and Zonal Railway Circulars and as per employers requirement or as given in DPR.
- Shifting of S&T gears e.g. Location Boxes to make way for earth work, modifications to LC gates should be catered for.
- Provision has to be made for shifting of Signaling Cables / OFC / Quad Cables etc. on account of possible infringement of earth work.
- Quantities have to be catered for phase working.
- All the works have to be carried out as per the Railway practices and general arrangement drawing.
- Quantities like trenching in rocky areas, bridges etc should be taken care of based on the survey details and infringement plans
- Phase plans and SIPs to be made separately.
- Soft copies of all Plans / Drawings / Documents to be supplied i.e on CDs.

ANNEXURE : Signal A – 1

SIGNALLING & TELECOMMUNICATION INFORMATIONS SHEET

SN	INFORMATIONS	DETAILS
1.	Name of Station along with Standard of Interlocking, Class of Station	
2.	Age of signaling installation (year of commissioning of present Cabin/ PI/ RRI)	
3.	Present Operation of Signaling like by Central Panel / End Panel, PI / RRI, or lever etc.	
4.	Type of signal (MACLS, MAUQ, LQ etc.	
5.	Type of signal Lamps- LED/TRIPLE POLE /other	
6.	Operation of points –MECHANICAL /MOTOR	
7.	Type of point motor- Make, Type, Age, Wiring through point JB or direct, AC immunized etc.	
8.	Details of GF(Ground Frame) like –No of Lever, EPD, EPL etc	

SN	INFORMATION	DETAILS
9.	Type of Axle counter –Analog/Digital, Single section /Multi Section, No of detection points, make, version, Age.	
10.	Type of indoor relays-MM or MC, interlocked relays. Type of relays used for external circuits- AC immunized etc.	
11.	Type of wiring of Relays (In case of Metal to metal –Wiring on IDF/Pre wired tag, In case of Metal to carbon-Wiring directly from relay to relay or through IDF).	
12.	Type of Operating Panel (Combined Operating cum indication panel or separate with special features if any).	
13.	Other Indoor details like type of flasher relay , Interlocked relays, Latch relays, Type of Fuses, special features/ Equipment etc.	
14.	Operation of points (By point Group / Power Contractor unit from station or from site etc.)	
15.	Crank handles interlocking – KLCR, HKT, Voltage of operation, location – station / site.	
16.	Power supply arrangement –IPS/Discreet (in case of IPS –Make , Type , Capacity of SMR, inverter, converter, Battery Capacity , age of battery, condition of equipment) (In case of Discreet-Capacity of charger , make age and condition), details of solar supply if any.	
17.	Block working-Type of Block, Block Filter, bell unit, earthling etc.	
18.	Details of Track circuits (i.e. Length of Track Circuit, type of Track Relay, First track repeater relay, QSPAI relay, Choke, Charger, etc.).	
19.	Type of Data logger-Capacity, Make , Condition , Networked , CMU ETC.	
20.	Telecom facilities like number of control phone, BSNL phone, Gate phone etc.	
21.	Telecom Installation at the station :Quad / RE cable, Quad wise Utilization of quads of the quad cable,	
22.	OFC : No. of fibers in the OFC, Fiber wise utilization of OFC, STM equipment details with their make and installation date, utilization of channels, details of the mux installed at the station with their date of installation, utilization of channels, power plant installation details with details of capacity of the batteries and their date of installation.	
23.	Existing cable route Plan of Signaling& Telecom Cables for Station Yards and Block Section.	
24.	Any special features of the station.	
	NOTE: Above information sheet to be prepared for each station/Interlocked LC gate/IBH independently. Above items are only indicative, any special signaling and telecom arrangement at the station should be brought in this sheet.	

ANNEXURE Signal A – 2**SIGNALLING & TELECOMMUNICATION INFORMATIONS SHEET**

(For Interlocked LCs of Station yards and Mid Section)

SN	INFORMATIONS	DETAILS
1.	Gate No.	
2.	Km of the Gate	
3.	Section (Between the stations and controlling station)	
4.	Age of signaling installation (year of commissioning)	
5.	Type of Barrier (Leaf / MLB / POLB)	
6.	Type of signal (MACLS, MAUQ, LQ etc.)	
7.	Type of signal Lamps- LED/TRIPLE POLE /other	
8.	Operation of gate – MECHANICAL /MOTOR	
9.	Housing (Porta cabin / brick mortar structure)	
10.	Details of GF (Ground Frame) like – No. of Lever, etc. if any	
11.	Methodology of approach warning, if any	
12.	Type of indoor relays - MM or MC, interlocked relays. Type of relays used for external circuits- AC immunized etc.	
13.	Type of wiring of Relays (In case of Metal to metal –Wiring on IDF/Pre wired tag, In case of Metal to carbon-Wiring directly from relay to relay or through IDF).	
14.	Type of Panel (Combined Operating cum indication panel or separate with special features, if any).	
15.	Other Indoor details like type of Fuses, special features / Equipment etc.	
16.	Detection of closing through magnets provided or not	
17.	Gate control interlocking – KLCR, HKT, Voltage of operation, location – station/site.	
18.	Power supply arrangement –IPS/Discreet (in case of IPS –Make , Type , Capacity of SMR, inverter, converter, Battery Capacity , age of battery, condition of equipment) (In case of Discreet- Capacity of charges , make age and condition)	
19.	Gate building infringing with alignment or not	
20.	Barrier infringing with alignment or not	
21.	Type of Data logger - Capacity, Make, Condition of RTU, Modem, Networked, CMU, etc.	
22.	Telecom facilities like gate phone / EC socket etc	
23.	Mode of communication i.e quad cable / wireless etc.	
24.	Availability of power supply AT / Local (Duration for which local supply is available in general), Details of solar supply if any	
25.	Any special features of the gate.	

NOTE: Above information sheet to be prepared for each station / Interlocked LC gate / IBH independently. Above items are only indicative, any special signaling and telecom arrangement at the station should be brought in this sheet.

Scope of activities of Civil, electrical and S&T for detailed engineering of project is annexed as Annexure for the guidance of consultants.

2. Bid process management for EPC tenders for the project:

SCOPE AND OBJECTIVE:

Objective:

The aim of this contract is to obtain Consultancy Services for bid process management of EPC tenders for the project including all civil engineering structures, tracks, signals, telecom facilities, traction arrangements Electrical (Traction and General Services), tunnel ventilation, solar energy, escalators, elevators, green buildings, maintenance depots, stations, operation control centre, offices, residential buildings, station integration areas, bridges, flyovers, elevated and surface sections over the project routes including formation, tunnels etc.

The services shall include tender packaging, preparation and finalization of tender documents for EPC tenders, evaluation of tenders. The scope of work includes but is not limited to works, consultancy and procurement contract(s) including preparation of EPC tender documents using standard bid document as applicable and rendering any other assistance to Railway during tendering process and in finalization of tenders and execution of Contract agreements for all contracts for the Projects/Works. The Consultant in its assignment shall be guided by the Model Documents and the relevant Manual of Specification and Standards for Railway projects published by Ministry of Railways and the relevant rules, regulations and provision of law.

Objective is to procure transaction related advice including customising the bid documents with relevant schedules (consist of documents and drawings) and assist in the bidding process and award of the EPC contracts in a manner which ensures participation by the best available companies/firms in the bidding process.

Scope of Services:

- i. **Review and update the cost estimates contained in the detailed estimate/DPR of the project:** The consultant shall review and update the cost of the project contained in detailed estimate for the EPC tender. He shall ensure that appropriate provision have been made for physical and price contingencies, financing costs, interest during construction etc.
- ii. **Preparation of tender document for EPC tenders :** Collection, compilation and analysis of relevant data and preparation of all documents and drawings required for the bidding process related to finalization of EPC contractor.

The tender documents (including RFQ, RFP and model agreement) are to be prepared by consultant, keeping in view the model documents and relevant manual of specification and standards for Railway projects published by Ministry of Railways.

- iii. **Finalization of specifications, standards and codes of practice to be followed.**

The recommended specifications, standards and codes of practice will be in accordance with the relevant Indian Railway Standards (IRS) including codes and guidelines issued by RDSO wherever applicable (like Earthwork, and Bridges, OHE, PSI, Escalators, Elevators, General services, solar energy, tunnel ventilation, green building etc.) and relevant BIS codes of practice/specifications for other structures as decided in consultation with employer.

iv. Preparation of tender packages and tender documents (including systems):-

Based on the output of detailed Engineering consultant and required inputs from detailed design consultant, the general consultant shall prepare bid documents and specified schedules including technical specification, bid drawings etc. for various tender packages of each project in consultation with the employer.

- (i) The tender and contract documents for the agreed tender packages shall be prepared based on latest applicable model documents published by Ministry of Railways and applicable relevant schedules.
- (ii) The bids would be invited by Railways on the basis of the tender documents prepared by the consultant.

v. Selection of contractors/suppliers/Consultants :-

The consultant shall assist Railways in the process of selection of EPC contractors, consultants and suppliers. The scope of services to be rendered by the consultant in this regard shall include, but not necessarily be limited to:

i. Pre-qualification of contractors for bidding (as applicable)

Consultant shall undertake all necessary works regarding preparation for RFQ document adapting model RFQ document, announcement, receiving and evaluation of contractor's RFQ documents and recommending to Railways the pre-qualified list for their acceptance based on RFQ criteria, in case it is decided to do pre-qualification of contractors for the project/work. In other cases, the contractor will be selected based on single stage two envelope system or single stage one envelope system. In single stage two envelope system the technical evaluation based on EQC will be done first to shortlist the eligible contractors only whose financial bids will be opened and evaluated. In single stage one envelope system, evaluation of technical and financial offers will be done in one go. Consultant will assist Railway in selection of contractor in either of the cases as decided through the entire process.

ii. Evaluation of the tender proposals and recommendations for the selection of the contractors for all contracts

- a) Perform independent evaluation of all tender proposals for all contracts received within reasonable time period as specified by Railway.
- b) Prepare a confidential Executive Evaluation Summary Report within reasonable time period as specified by Railway and to make a presentation pertaining to the recommendations to a committee and/or a working group that may be set up by Railway.

iii. Contract Negotiations

- a) Prepare information and data to be used in contract negotiations.
 - b) Assist Railway in negotiations with the selected tenderer and record minutes of meeting.
- iv. Assist Railway in preparation of Contract agreements with the successful bidder after acceptance of contract negotiations.**

3. Role and Functions of General Consultant for Bid Process Management:

- a. The Bids shall be invited in accordance with the latest guidelines issued by Ministry of Railways with applicable Model Documents.
- b. In case of requirement of pre-qualification, the Pre-qualification Documents (RFQ) shall be developed based on the Standard RFQ document duly deciding the Evaluation and Qualification Criteria in consultation with Railways.
- c. The Consultant shall be required to develop Complete Bid Documents for EPC Works Contracts using model document. The document will contain all Bid schedules, applicable specifications, tender drawings, Model Contract Agreement etc complete based on applicable guidelines and shall be prepared and developed based on inputs available from detailed engineering in further consultation with Railway. The consultant shall develop Employers' Requirements suitable for EPC Contract.
- d. **Technical Specifications/ Standards**

Research Design and Standards Organization (RDSO), Lucknow, India, an organization of Ministry of Railways, Government of India has standardized the technical specifications for various components of railway systems in India as Indian Railway Standard (IRS) Specifications, which are generally based on International Specifications and adopted to Indian conditions. The Employer's requirements to be developed by the Engineering Consultant as part of the bidding document for this work will generally conform to the IRS Specifications/ Indian Standards. However, the consultant shall propose proven cost effective technical alternatives and International Standards/Specifications for selected items for approval of Railway. The Ministry of Railway has permitted introduction of new technologies/products for certain Civil, Electrical (OHE/PSI/General Services), Escalators, Elevators, General services, solar energy, tunnel ventilation, green building etc. and S & T items for Railway project.

e. Value Engineering

The Employers' Requirements shall be discussed in such a way that the works Contractor has scope and motivation to do the value engineering during implementation of the EPC Contract.

- f. The consultant shall keep in view the procurement guidelines of Ministry of Railways while finalizing the RFQ Documents (as applicable) and Bid Documents (RFP) and preparing the evaluation reports of prequalification proposals and bids for works.

g. The responsibilities of consultant shall also include

- a) Consultant will prepare tender documents as per model documents including Pre-qualification & bid documents. Consultant will assist Railways in following :- conducting of pre-bid meetings , preparation of minutes of the meeting , furnishing of clarifications, up-dation of the documents based on discussion during the meeting and correspondence, evaluation , negotiations (if necessary) of bids invited by Railways and finalization of award of contracts. Consultant will also provide necessary assistance and documentation at various stages of procurement, as required.
- b) Consultant will identify the training needs in the area of new technologies, modern mechanized construction methodologies including course content, training Institution, construction sites and other details for enabling training of Railway personnel and will also submit training plan for meeting the objective.
- c) Consultant will arrange to provide all relevant specifications and standards that may be required for enabling Railway take or accept decision pertaining to Works or System`s EPC contract.
- d) Consultant shall also be responsible for the accuracy and completeness of the work. Mere acceptance by Railway shall not relieve consultant of their professional obligations to correct at their own cost any errors in their work.
- e) Consultant will be responsible to ensure that the design and specifications adopted during tendering on the project should be such that they, in no way, limit the requirements regarding competitive bidding.
- f) It is also essential that the consultant is and remains demonstrably impartial in the performance of its duties.
- g) Patents – Consultant shall at all times indemnify Railway against all claims which may be made in respect of the items for infringement of any right protected by patent , registration of design or trade mark.
- h) Consultant shall prepare and issue weekly/monthly progress reports on the consultancy work.

- i) Consultant shall write a day by day consultancy diary which shall record all events pertaining to the administration of the Contract, request from and orders given to the Consultant, any other information which may at a later date be of assistance in resolving queries which may arise concerning execution of the consultancy contract.
- h. **Overall assistance to Railway for bidding/procurement for selection of contractor(s) for construction of Projects.**
 All bids would be invited by Railway for the project, with assistance of the consultant on the basis of the model bid documents. The consultant shall assist Railway to implement a series of bidding process for selection of contractor(s). This may include but not limited to;
 - a) Prequalification process and evaluation for civil structure and track works.
 - b) Bid processing and evaluation for civil structure and track works.
 - c) Contract negotiation and finalization for civil structure and track works.
 - d) Prequalification process and evaluation for electrical, signaling and telecommunication works (system).
 - e) Bid processing and evaluation for system works.
 - f) Contract negotiation and finalization for system works.
 - g) Execution of contract agreement with the selected bidder for each tender.

Scope not exhaustive

The scope given above is not exhaustive and the consultant shall undertake such other tasks as may be necessary to successfully complete the bid process for the project.

4. Reporting

- a. The Consultant shall prepare the following reports and documents (not limited to) in hard / soft copy using relevant software program **for Bid Process Management** of the Project:
 - a) Inception Report including initial technical appreciation of the services requirement and identifying both the overall work plan and the analytical steps to complete the work, the organizational structure of consultant, working procedure/ decision-making procedure, time schedule, staff deployment, obligation of the Client and Consultants, etc.
 - b) Pre-qualification Document (RFQ) for Civil, Structure & Track Works including Evaluation Criteria (if applicable).

- c) Evaluation Report of Prequalification Proposals for Civil, Structure & Track Works.
- d) Bid Document (Draft / Final) (RFP) for Civil, Structure & Track Works including evaluation criteria.
- e) Pre-bid meeting minutes including amendment to bid documents based on suggestions accepted by employer.
- f) Bid Evaluation Reports for Bids for Civil, Structure and Track Works as per decided contract packages including contract negotiations minutes.
- g) Functional and Performance specification including RAMS criteria for System works.
- h) Pre-qualification Document (RFQ) for System Works (if applicable).
- i) Bid Document (draft /final) (RFP) for System Works.
- j) Evaluation Report of Prequalification Proposals, Pre- bid meeting minutes including amendment to bid documents based on suggestions accepted by Employer, Bid Evaluation Reports for Bids for System Works including contract negotiations minutes.
- k) Documentation needed at various stages of procurement.
- l) Presentations for progress reporting to Employer.
- m) Report on interfacing issues along with Interface Matrix. Methodology for interface so that construction to be adopted for Civil, Electrical, Signalling and Telecommunication is optimized & work is completed in time.
- n) Monthly Progress reports.
- o) Intermediate reports generated on the feedback of pre-bids at various stages.
- p) Other necessary reports and documents as advised by employer in connection with Bid Process Management.

5.0 TIME SCHEDULE

Detailed Engineering of the project:-

Activity wise Priority & time schedule for collecting required field data, preparation of ESP, SIP, GAD & working drawings of bridges, station buildings, staff quarters, S&T structures, OHE and electrical structures and preparation & finalization of L- section including other allied activities is as follows. The above mentioned activities and the scope of work under Part A of

services relating to Detailed Engineering of project is to be completed within a period of 4 months (16 weeks) from the date of acceptance of the offer.

Sr. No.	Activities involved	Completion schedule from issue of acceptance of offer 'D' in weeks
1	Completion of field work in connection with FLS	D+4
2	Preparation of Land acquisition proposals	D+6
3	Submission of L- section	D+8
4	Finalization of alignment.	D+10
5	(A) Completion of Field Geotechnical Investigations. (B) Submission of Geotechnical Report.	D+10 D+12
6	<i>Submission of Yard Plans & Approval by Railway</i>	D+12
7	Submission of GADs of bridges, station building, staff quarters & Approval by Railway	D+12
8	Preparation and submission of existing and proposed Cable route plans and other works related to S&T/SIP	D+12
9	Submission of Detailed Construction estimate/updation of detailed estimate	D+15
10	Staking of alignment on ground and fixation of Concrete Pillars	D+12
11	Approval of various items by Railway	D+16
11.1	GAD's & ESPs – Approval of Rlys.	

Note-

- (i) Delay damages are liable to be imposed for not achieving the completion schedule of mentioned activities
- (ii) Consultant to submit detailed activity wise schedule Program of various activities in consultation with the employer within 28 days, failure to submit the program will attract a penalty of Rs 25,000/- per week. If the agreed program is not followed for three consecutive months, a penalty equivalent to 10% of delay damages is liable to be imposed on the contractor.

Bid Process Management:

The complete activities of bid process covering updation of detailed estimate, bid document preparation, and bidding process shall be completed in 6 months (24 weeks). Details are as under:-

Sr. No.	Activities involved	Completion schedule from date of completion of detailed engineering (4months from date of acceptance) 'D' in weeks
1	Updation of cost	D+2
2	Submission of RFQ documents	D+4
3	Submission of RFP documents and all related bidding documents and drawings	D+8
4	Shortlisting of contractors by finalizing RFQ evaluation	D+12
5	Assistance in Bid process till opening of RFP	D+20
6	Assistance in bid process till finalization of EPC contract	D+24

5.2 Stage Payment Schedule:**Detailed Engineering services:-**

SN	Description of Activity/Items	% Payment of the accepted offer value for this part
1	Final Location Survey- L sections, Index plan	10%
2	Complete Geotechnical investigation with report	20%
3	GADs of bridges including ROB's/RUB's/LHS/ Subway/FOB's	
	Submission of Draft GAD	5%
	Submission of Final GAD	5%
4	ESP's of station yards	
	Submission of draft ESP's	5%
	Submission of Final ESP's	5%
5	SIP's and other S&T details	10%
6	Layout Plans for OHE and planning of other electrical works including SP's/SSP's	10%
7	Land plans and Land acquisition proposals on proforma, forest clearance (if applicable)	5%
6	Layout plans for stations, service buildings and residential quarters	5%
8	Preparation/updation of detailed estimate	10%
9	Final report	10%
	TOTAL	100%

Notes:

- (1) Payment will be made only after ascertaining the acceptability of the document/plan/diagram after scrutiny by Railway. Otherwise it would be returned to the Consultant indicating the proposed action which may include termination of contract also if the work is not found to be of reasonable good quality. In this regard the decision of Railway shall be final.

Stage Payment:

Bid process Management:-

Sr. No.	Activities involved	Payment % for this part
1	Updation of cost	5%
2	Submission of RFQ documents	10%
3	Submission of RFP documents and all related bidding documents and drawings	20%
4	Shortlisting of contractors by finalizing RFQ evaluation	20%
5	Assistance in Bid process till opening of RFP	25%
6	Assistance in bid process till finalization of EPC contract	20%
	Total	100%

6.0 Personnel:

Detailed Engineering services:

The Consultant shall deploy the required number of personnel for the key positions with requisite qualification and experience as mentioned hereunder as per the scope of project:

S. No.	Position	Qualification	Experience In Similar Work [years]
1	Project in-charge(Project Manager) (Consultants Representative)	Graduate in Civil Engg.	5 years in DPR/FLS/PETS
2	Survey Expert	Graduate/Diploma in Civil Engg. Or Retired Railway SSE/W, AEN/XEN having min 3years of Survey experience.	At least three years' experience in survey of Railway/ Metro Projects.

3	Geotechnical Expert	Graduate/Diploma in Civil Engg. With specialisation in geotechnical investigation	At least three years' experience in geotechnical investigation of Railway/ Metro Projects.
4	Drawing Expert	Graduate/Diploma in Civil Engg. With specialisation in AutoCAD	At least three years' experience in Preparation of GADs/L-section/ESPs of Railway/ Metro Projects.
5	Estimation Expert	Graduate/Diploma in Civil Engg. With specialisation in Estimation	At least three years' experience in estimation of Railway/ Metro Projects.
6	ELECTRICAL ENGINEERING EXPERT(OHE)	Graduate/Diploma in Electrical Engg. OR Retired Railway SSE/OHE, AEE/DEE OHE with min 3 Years experience of OHE works	At least three year experience in Railway electrification (OHE) works.
7	ELECTRICAL ENGINEERING EXPERT-GS	Graduate/Diploma in Electrical Engg or Retired Rly Electrical GS Engineer with minimum 3 years of General Electrical works experience.	At least three year experience in General Electrical works
8	SIGNALLING AND TELECOMMUNICATION EXPERT	Graduate/Diploma in Electronics Engg./Electronics & Telecom Engineering. OR Retired Railway SSE/ASTE/SSTE/DSTE Signaling with min 3 Years of Signalling/Telecom experience	At least three year experience in Railway signaling works.

Bid Process Management:

The qualification of Consultant staff for **Bid Process Management** shall be as given below:

POSITION	CRITERIA	QUALIFICATION
Team Leader cum Procurement Specialist	Academic qualification	Minimum Bachelor's Degree in Civil Engineering
	General Work Experience	Minimum 20 years
	Experience in Railway/Transport Projects	More than 10 years
	Experience as Project Director/ Project Manager/Team Leader	More than 6 years of experience for Railway /Metro/ Suburban/ transport projects

POSITION	CRITERIA	QUALIFICATION
	Experience as procurement Specialist	More than 5 years of procurement experience for Railway /Highway/Metro/ Suburban/ transport projects with good understanding of EPC tenders
Procurement Expert - 25 KV AC Traction System Procurement Expert - Railway Signalling	Academic Qualification	Minimum Bachelor's Degree in Electrical Engineering.
	General Work Experience	Minimum 15 years
	Experience as System's Expert in the relevant field	More than 05 years and he should have provided consultancy services for at least two Projects involving 25 KV/ 2x25KV AC System in Railway/Metro/Railway Electrification Projects successfully.
	Project Procurement Experience	More than 03 years and he should have participated in concept planning, procurement of modern Electrification of Railway Systems.
	Academic Qualification	Minimum Bachelor's Degree in Electronics/Electronics & Telecommunication/Signaling/Electrical Engineering.
	General Work Experience	Minimum 10 years
	Experience as System's Expert (S&T) in the relevant field	More than 05 years and he should have provided consultancy services for Projects involving Signaling and Telecom Design in Railway/Metro/Sub-urban Railway Signaling Projects successfully.
	Project Procurement Experience	More than 03 years and he should have participated in concept planning, procurement for modern Railway/Metro/Suburban Signaling Systems.
Procurement Expert - Finance	Academic Qualification	Minimum Bachelor's Degree with Specialization in finance
	General Work Experience	Minimum 10 years
	Experience as Finance Expert in the relevant field	More than 05 years and he should have provided consultancy services for Projects involving EPC in Railway/Highway/Metro Projects successfully.
	Project Procurement Experience	More than 03 years and he should have participated in concept planning, procurement for Highway/ Railway/Metro projects.
Key Procurement	Academic qualification	Minimum Bachelor's Degree in the relevant field.

POSITION	CRITERIA	QUALIFICATION
Experts	General Work Experience	More than 10 years
	Experience as Same/Similar Position	More than 5 years and provided consultancy service in two infrastructure project in relevant field.
Document Controller	Academic qualification Experience in similar position	Graduate in any discipline More than 5 years for documentation Preferably Experience of Handling Tender/Contract Documents
CAD Engineer/Draftsman	Academic qualification Experience in similar position	Graduate in any discipline More than 5 years experience for Auto CAD working
Steno Secretary /Photocopy operator, accountant /administration	Academic qualification Experience in similar position	Graduate in any discipline More than 3 years experience in the similar capacity.

7. CLIENT INPUTS:-

1. Detailed Project report for the project will be shared with the consultant along with RFP.
2. Extension of help by Railway to the Consultant in coordination with other concerned departments.
3. For the consultancy services in connection with Bid process management, provide rent-free air-conditioned total office space of 300 Sq. ft floor area (Approx) with reasonably adequate electrical switch points. The entire office space shall not be necessarily provided at one place by Railway but may be provided at different offices of Railway within E. C. Railway jurisdiction. All office furniture and furnishings including chairs, tables etc. as required, office equipment including computers, etc., have to be arranged by the consultant. Power consumption charges and telephone charges are to be borne by the consultant. Security and housekeeping will also be provided by consultant. Transport facility to the staff will be provided by the consultant at their own cost.
4. Assist the foreign Consultant, Sub-Consultants and personnel to obtain work permits and such other documents as shall be necessary to enable the Consultants, Sub consultants or personnel to perform the Services in India for this assignment.
5. Assist foreign personnel and, if appropriate, their eligible dependents to be provided promptly with all necessary entry and exit visas, residence permits and any other document required for their stay in India.
6. Issue to officials, agents and representatives of the Government, all such instructions as may be necessary for appropriate, prompt and effective implementation of the Services.

Annexure

Scope of activities for detailed engineering of the project

Scope of activities – Civil

<u>Sr No</u>	<u>Description of activity</u>
1	Conducting Final Location Survey (FLS) using tenderer's own Engineers, labour, tools, plant & equipment, materials, transportation with all lead and lifts, duly taking all safety precautions to ensure safety, using survey instruments like Total Stations, DGPS, Auto levels etc. and using MX Rail/Bently software as per the scope, terms of reference, relevant provisions of Indian Railways Code for Engineering Department (1999, Third Reprint) with up to date correction Slips, and as directed by the Engineer-in-charge; including Topographical survey for 100m corridor on both side on new line alignment, taking the longitudinal levels at intervals of 20m & at obligatory points and cross sectional levels at an interval of 5m (or less as decided by Engineer in Charge as per the terrain), (extra width to be covered at some locations as directed by Engineer in charge). This shall include staking of approved alignment with concrete Pillars (150 x 150 x 900 mm size with 450mm projected above ground level) at an interval of 100m and with wooden/concrete pegs (50 x 50 x 450mm size) at every 20m where track is away from the existing track (cost of wooden pegs is inclusive). The concrete Pillars shall also be fixed on curves indicating transition portion, apex point, crown of curve, beginning and end point of circular curves, (5 locations for each curve), at major bridges two pillars one on either side. Including submitting list of distance of centre line of proposed BG line from centre line of existing BG line at every 20m interval for doubling project.
2	Providing and fixing cast-in-situ or precast M-25 concrete pillars of size 150 x 150 x 900 (300 x 300 x 900mm in case of TBM as per item 4.7 (iv) of Section-5 Terms of reference) with 450 mm / 300mm projected above ground level on straight and curves as per Scope of Work & Technical Specifications with Contractors' own materials, tools and plants; including all leads and lifts and crossing of track etc.; including all taxes and royalties complete; including painting, marking the pillars at site; including setting out of curves at site indicating transition portion, apex point and crown of curve, beginning and end point of circular curves etc. The rate includes the cost of all material including centering, shuttering, cutting, binding, reinforcement etc all inclusive. Note-The pillars may be erected as directed by the Engineer in-charge, if decided these pillars shall work as boundary pillars, the distance of proposed centre line of BG track shall be marked on these pillars.
3	Preparation and submission of Detailed Longitudinal sections (L-Sections), Detailed Plans and Cross Sections. Preparation and submission of Detailed Longitudinal sections (L-Sections) on MX Rail/ AutoCAD showing 5 km in each sheet at a scale of 1:5000 longitudinal and 1:500 laterally/vertical. The Longitudinal section will have the details like km/chainages of the permanent features such as stations level crossing, bridges (existing and proposed), FOBs, ROBs, RUBs tangent points of all curves (existing & Proposed), overhead crossing and other important physical features as decided by Engineer-in-charge, existing Rail level of BG track, ground level, existing formation level of BG line, proposed formation level, rail level, ground level at Toe of existing embankment, depth of cutting and height of bank with respect to ground level at toe of existing embankment gradient existing and proposed in BG, details of HFL/clearance/free board of existing bridges and proposed bridges, bed levels of each bridge. Preparation and submission of the Detailed Plan on MX Rail/Auto CAD showing the alignment of Railway line, curve, curve details, magnetic bearing, details of bridges (existing/proposed BG), Platforms at station, Railway land boundary, level crossings, all permanent/ temporary /physical structures within

	the Railway boundary as required for L section, locations of tangent points of curve, turnouts, center line of station and its name, overhead crossing, underground crossings, alignment of the Road in the approached, Road network parallel to Railway corridor, configuration Nallahs/ River/ water streams etc. Plotting and submission of the Cross section on MX Rail/AutoCAD in 50m corridor on both side of center line of existing track and for 100m on west side at diverted alignment as the case may be, taking the longitudinal levels at intervals of 20m & at obligatory points and cross sectional levels at an interval of 5m. a. The proposed grade shall be finalized in consultation with Railway Administration to achieve most economic and feasible section of the formation. b. Rail levels & HFLs of all the bridges should be found out and indicated on the L-section. c. The L-section & Plan shall be prepared in form confirming to prevalent practice on ECR to the satisfaction of Engineer-in-charge and necessary changes/ modifications during course of approval will be done by the consultant. d. After the approval of employer the consultant shall submit drawings in 3 hard coloured copies along with good quality (double matt film 75 micron) original coloured tracing and two soft copies on CD. Cross section shall be also plotted and bounded in proper booklet in one set along with earthwork calculation register.
4	Preparation of land plans and land acquisition proposal in five copies (based on requirement of private/Non Railway land for the project worked out from finalized L-section/alignment of the new corridor) as per Revenue departments requirement of concerned State including collection of property cards/7/12 Abstract/8a Abstract including superimposition of revenue record on proposed alignment & calculation of area to be acquired. Preparation of statement of area to be acquired along with land owners details etc. the item includes submission of proposal to respective revenue official along with follow up for joint measurement order. This will also include identification & land acquisition proposals for dumping locations for ballast, blanket etc along the finalized alignment complete including necessary survey, revenue record collection. Follow up & preparation of area statement along with land owner's list etc complete. Assistance to employer and revenue authorities in joint measurement is also included. All required assistance till completion of land acquisition and its transfer to Railways will be rendered by the consultant.
5	Finding out utility services including infringement along the proposed alignment such as electrical line/poles, telephone line, high tension lines along with their voltage & sag height, OFC cables, existing RE cables, Quad cables, retaining walls, trees, pipeline for water, petro, gas etc complete including preparation of kilometer wise plan showing all utility services which need to be shifted before construction etc. complete.
6	Hydrological investigation for Bridges: Leveling of the river profile for lengths indicated & required (1Km on either side U/S & D/S for Major Bridges, 4Km on either side U/S & D/S for Important Bridges & 0.5Km on either side U/S & D/S for Minor Bridges) traversing the catchment area of stream, collection of hydrological data and hydrological calculations for waterway of Bridges. Based on this, the consultant shall bring out & indicate the adequacy of waterways provided in existing BG – corridor & recommendation on additional requirement of waterway at any of the bridges. Keeping in view the existing span arrangement, the proposed span arrangements shall be recommended. The consultant will decide technically most suitable site for the bridges concerned as close to the proposed alignment as possible finalizing. The lengths of spans, type of substructure, as well as design of scour beds & guide bunds wherever required. The work shall include submission of detailed report & calculations as required for a Railway Project based on Railway guidelines & codes like IRS – substructures & foundation code, Engineering code, RDSO report RBF – 16, flood estimation report published by CWC etc and as per technical specification.

7	Preparation of ESPs of various Stations on Auto CAD for Quadrupling as per requirement of Railway showing existing & proposed position of tracks and related structures. The consultant shall submit advance copy of the ESPs on white paper for approval of employer. After the approval of employer the consultant shall submit drawings in 3 hard copies along with good quality (double matt film 75 micron) original coloured tracing and two soft copies on CD. Note:-The colour scheme to be followed in the drawing shall be as per standard practice of East Central Railway or as per the direction of Engineer-in-charge. The scope includes required corrections and modifications as suggested by approving authorities of Railways till its final approval. Required follow up with approving authorities including explaining them the ESP will be needed from consultant.
8	Station Buildings and other structures: Preparation of existing & proposed layout plan, along with general arrangement drawings (if Type Plans are not available) of Station buildings, service buildings, staff quarters & structures on Auto CAD and submission of print on white paper and tracing for approval of employer. Further association for approval from Railways duly complying with the observations made by them and incorporating all such modifications in GADs till its final approval. Note -Railway's Type plans of buildings and structures shall be used in general.
9	Preparing and submitting the Index Section & Plan for the complete alignment showing all the existing field details/ ground features and proposals thereof similar to the detailed L-Section and plan but on scale 1 cm = 500 m Horizontal and 1 cm = 10 m Vertical in plain terrain or suitable vertical scale in Ghat/ Hilly terrain in Hard Copy (6 Nos.) as well as in Soft Copy and Two Copies on Polyester based tracing paper (100 to 150 Microns) complete as directed by Engineer -In Charge. The charge to be paid to Survey of India for obtaining required contour maps will be paid by Railway. The item also includes preparing plan of the area up to 100m on either side all along the proposed alignment by Plane Tabling or other suitable system using advanced survey instruments. 2.The map to be plotted on AutoCAD on scale 1cm = 50m and to be submitted on Hard Copy (6 Nos) along with Soft Copy and Two Copies on Polyester based tracing paper (100 to 150 Microns) as directed by Engineer -In -Charge.
10	Preparation of the General Arrangement Drawing for all minor, major, important bridges based on finalized L- section for the proposed alignment & detailed geotechnical investigation and hydrological investigation carried out by the consultant. GADs of proposed ROB/RUBs and FOBs at various stations based on finalized GAD of stations shall also be covered in the scope.
11	Conducting Survey within 5Km aerial leads from the proposed alignment of prospective borrow areas of soil and blanket material to assess quantity and quality of materials available for construction of embankment. For ascertaining the quality of material, grain size analysis, gradation and CBR tests are to be carried out which will be paid separately as per relevant items of BOQ. The list of established Ballast crushers/quarries and their lead for obtaining ballast / blanket material as per railway specifications is required to be submitted. (Survey report is to be given for each block section).
12	Preparation/updation of Detailed Estimate of Civil Engg., S&T and Electrical including OHE based on details collected in FLS and Geo-technical investigation, requirement of S&T and Electrical installations in station areas and yards, and all other relevant information gathered in this detailed engineering of the entire project, market surveys and analysis for determining the rates and other important features required for preparation of detailed estimate as per direction by the Engineer, provision of Engineering code & technical specification. The consultant shall submit copy of calculation of the quantities in both hard copy (2 No.) and soft copy (2 No.) on MS-Excel & Ms-Word as per format prescribed by the Engineer-in-charge.
13	Exploratory drilling of 100 mm dia bore holes in all types of soils including weathered rocks (RQD upto 50%) except hard rock down upto specified depth upto maximum of 30m below bed/Ground level for important bridges, major bridges, minor bridges, ROB/RUBs and along the proposed alignment at

	specified spacing normally at 200m to 300m apart in case of uniform type of soil & closely spaced in critical zones, including cleaning and collection of disturbed & undisturbed soil samples at every change of stratum and interval not exceeding 1.5m (undisturbed soil samples shall be collected as per IS 2132:1986). The cost includes all contractors labours, tools, machinery, equipments including its mobilization, demobilization / shifting to each bore hole location of equipments, fuel, labeling and Indexing of samples, the cost of wooden boxes for storage of samples. For major & Imp. Bridges, the boreholes shall be made at every pier/abutment locations. Conducting SPT (Standard Penetration Test) as per BIS 2131-1981 including all contractors labour, tools, machinery, equipment, etc and complying all provisions of BIS 2131-1981 as directed by Engineer In-charge.
14	Drilling 85mm dia holes (with Nx Bit through 100mm dia hole) to max. depth of 4m in intact Hard rock (RQD > 50%) below the depth of bore and collecting disturbed & undisturbed samples at specified interval and conducting tests viz. Sieve analysis, Hydrometer analysis, Natural moisture content, bulk density, dry density, specific gravity, liquid limit, plastic limit, plasticity index, shrinkage limit, Direct Shear test (for Non-cohesive soils), unconfined compressive strength test, unconsolidated un-drained tri-axial test, consolidated un-drained / consolidated drained test (for cohesive soils), consolidation tests (cohesive soils below water tests), chemical analysis on soil samples, soil classification, vane shear test, swell test etc as per provision of IS: 2720 Part I to Part XXVI and chemical analysis of water samples collected from boreholes as per IS: 3025 and calculation of SBC. The scope include conducting laboratory tests on collected rock samples as per IS code viz. specific gravity, porosity, SBC of rock calculation, ultimate crushing strength of rock, RQD, classification test etc complete. All the soil samples & rock samples are required to be preserved & handed over to Railway depth wise in wooden boxes. Based on the complete tests conducted for soil of rock samples, a comprehensive technical report of geotechnical investigation showing details of test results, calculations in approved formats with recommendation on foundation soil, type of bridges along with SBC recommendations at different depth, founding depth, requirement of any geotechnical improvement of ground for formation in cuttings & banks etc is to be prepared and submitted in 6 hard copies & soft copies. The scope also includes collection of water samples & conducting chemical tests on water as per IS codes. Further scope also includes carrying out Plate load test, determination of CBR, conducting laboratory tests on collected rock samples like density test, unconfined compression test, etc. complete as per codal provisions. The geotechnical investigation tests will be got done from NABL approved Lab.

Scope of Activities- OHE & General services- Electrical

Sr No	Description of activity
1	Survey of stations and preparation of detailed report indicating existing arrangement, proposed augmentation / modification of existing electrical power supply system. Station area including Station, Platforms, yards, offices, Quarters, FOB etc. having H.T./L.T. supply distribution system. Preparation of drawings on AUTO CAD indicating existing arrangements and proposed works to be executed as per survey report and approval of the same from railway authorities.
2	Study of existing power supply arrangement of section along with adjoining sections and preparation and submission of report on availability of traction power supply for augmentation of existing power supply and proposed TSS with rating of equipments based on voltage drop calculation in consultation with State Electricity Authority/ NTPC/Power Grid Corporation based on latest RDSO/CORE guidelines/standard in consultation with Railway. Assessing requirement of SCADA system and proposing suitable scheme for augmentation of existing Remote control centre. Location plans for proposed/argumentation of TSS shall also be submitted. The corrections, if any as and when required in the proposed scheme shall have to be carried out till it is finally approved by Railway. Three hard copies and one soft copy to be supplied.

3	Conducting survey for all the existing electrical crossing of complete section including measurement of horizontal distance of structures from the existing tracks etc, vertical clearances of electrical conductor & guard wire, depth of UG cable, size & type of casing pipe from the Rail level etc., angle of crossing, height and type of towers/poles and submitting the detailed report and preparation of sketch on Auto CAD on A-4/A-3 size of each existing underground/ overhead of crossing of the section and proposing modification on specified format as directed by Engineer-in charge. This shall bring out crossings upto 33 KV, 33KV and above and lines running parallel to tracks.
4	Foot by foot survey, preparation and submission of pegging plans, incorporating the location & type of OHE structures (Existing & Proposed) based on proposed ESP & SIP indicating track centers, track separations, setting distances of the OHE and other structures in the vicinity, proposed structural modifications in section/yards. Preparation of list of infringement to schedule of dimensions and proposal to remove the infringement supported with sketches. Location of provision/shifting of ATs, extension/raising of passenger/goods platforms, locations of existing/proposed FOBs/ROBs, Bridges, Sheds, LC gates S&T and service buildings, along with the proposed alignment of the track etc. and determining through site measurements whether adequate clearances are available for electric traction. The corrections if any as and when required shall have to be carried out till it is finally approved by Railway. RTFs, two hard copies and one soft copy to be supplied.
5	Preparation and submission of wiring cum sectioning diagram incorporating existing arrangement and required changes in the existing system based on RDSO/CORE guidelines/standard. The corrections if any as and when required shall have to be carried out till it is finally approved by Railway. RTFs, two hard copies and one soft copy to be supplied.
6	Preparation of locations plans indicating railway/non railway land for augmentation/of existing and proposed sectioning and sub-sectioning post. The corrections if any as and when required shall have to be carried out till it is finally approved by Railway. RTFs, two hard copies and one soft copy to be supplied.
7	Preparation of locations plans indicating railway/non railway land for augmentation/of existing OHE cum PSI maintenance depot. The corrections if any as and when required shall have to be carried out till it is finally approved by Railway. RTFs, two hard copies and one soft copy to be supplied.
8	Survey of section, preparation and submission of General Power Supply Diagram suitable for project requirement incorporating existing arrangement as per latest RDSO/CORE guidelines/standards. The corrections if any as and when required shall have to be carried out till it is finally approved by Railway. RTFs, two hard copies and one soft copy to be supplied.

Scope of Activities- S&T

Sr No	<u>Description of activity</u>
1	Preparation of Existing S&T cable route plan indicating location, distance and depth from center line of existing track, as per details obtained from ECR and Verifying the same at site/collection the same from site by taking measurements at site. The location of the cable is to be accessed at every existing OHE structure and at the junction ensuring all safety precautions, by Using Cable locator or any other advanced tool/equipment for the same as approved by engineer in-charge. The distance of cables from centre line of existing track at these locations should be mentioned after verifying the same. The plan should indicate the location of Optic Fibre Cable, Quad Cable and signaling cables separately with legends. Multiple routes of signaling cables in the yard to be marked separately. Location of Power

	cable (AT Cable/SEB supply) should be separately indicated. Location of bridges with their length and rocky areas should be indicated in the plan. Centre line of existing track, centre line of proposed track, toe lines of proposed track and Rly boundary should be indicated on the plan. The plan should be made for main line as well as station yards separately and submitted in three hard copies in A3 size and soft copy on CD in AutoCAD.
2	For Independent Interlocked LC gates: Collection of Signaling Interlocking Plan, Gate working Rule, Gate Number, section, WSL / OSL, Telephone with the nearest station, Barrier Type, gate lodge location, power availability, road signals, hooter, latest TVU and to collect data of existing signaling and telecom assets and prepare the information as detailed in Annexure Sig A 2 for the level crossing gate of terms of reference and prepare the plans. The plan will also have the location of gate lodge, gatemen quarters and any other facility provided. It should also be indicated whether the gate is infringing with proposed alignment.
3	Collection of the data of existing signaling and telecom assets and prepare the information sheet as per detailed in Annexure Sig A 1 & Annexure Sig A 2 of terms of reference. Infringement of any signaling and telecom structure with the proposed alignment to be clearly demarcated and mentioned.
4	Collection of prints of existing Signaling Interlocking Plans and preparing foot print of existing signaling equipment and operating rooms and other structures including telecommunication in a sketch along with measured dimensions. Copy of station working rule of the station shall also be collected. Equipment rooms shall include relay rooms, power room, axle counter room, data-logger room, DG room, TMS OCC, Station TMS arrangement, etc. Operating rooms will include ASM room, cabins, gumties etc. Relay room foot print to indicate arrangement of relay rack fixing, CT rack fixing and space available from all four sides.
5	Preparation of Signal Interlocking Plan (SIP) on the basis of approved ESP for the stations / Independent Interlocked Gates / Phase SIPs in the section. Initially only one copy for approval by employer to be submitted. Subsequently three paper prints to be submitted for approval of the Railway. Subsequently, SIP to be submitted on Tracing paper of 90 gsm as per policy of the Railway along with three hard copies.
6	Preparation of Telecommunication drawing and Cable Route Plan on the basis of approved alignment, ESP for the stations / Independent Interlocked Gates / Phase SIPs in the section. Initially only one copy for approval by employer to be submitted. Subsequently three paper prints to be submitted for approval of the Railway. Subsequently, Plan to be submitted on Tracing paper of 90 gsm as per policy of the Railway along with three hard copies.
