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VOLUME - IA

Technical Conditions of Contract (TCC) TSS SP SSP Works,
Section Birlanagar-Etawah, Jhansi Division (Gr. 239)

FOR

RE WORKS OF BHANDAI-UDI, BIRLANAGAR-ETAWAH AND FARRUKHABAD-SHIKOHABAD INCLUDING MAINPURI-ETAWAH

OF

NORTH CENTRAL RAILWAY

BHARAT HEAVY ELECTRICALS LIMITED

BHEL Maharatna Company	**Technical Conditions Of Contract (TCC)** **PROJECT ENGINEERING & SYSTEMS DIVISION** **HYDERABAD**	Ref No: HY/PE&SD/Projects/TCC/2018-19/TSS SP SSP Works/Jhansi Div/01 Rev. No. 00

TECHNICAL CONDITIONS OF CONTRACT (TCC)

FOR

TSS SP SSP Works, Section Birlanagar-Etawah, Jhansi Division (Gr. 239)FOR

RAILWAY ELECTRIFICATION PROJECT IN BHANDAI-UDI, BIRLANAGAR-ETAWAH AND SHIKOHABAD-FARRUKHABAD INCLUDING MAINPURI-ETAWAH, SECTION OF AGRA, JHANSI AND ALLAHABAD DIVISIONS OF NORTH CENTRAL RAILWAY UNDER RE PROJECT LUCKNOW, TOTAL RKM 386/440TKM

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Volume IA
Part I
Contract specific details

Chapter I- Project Information

1.0 Project Details

Bharat Heavy Electricals Limited has been awarded the "The Electrification of Railway Lines of the section Birlanagar-Etawah, Bhandai-Udi and Farrukhabad-Shikohabad including Mainpuri-Etawah of North Central Railway 386 RKM/440 TKM" project on EPC basis by Central organization for railway electrification (CORE), Allahabad.

1	Customer	:	Central organization for railway electrification (CORE), Allahabad.
2	Project Information	:	Electrification of Railway Lines of the section Birlanagar-Etawah, Bhandai-Udi and Farrukhabad-Shikohabad including Mainpuri-Etawah of North Central Railway 386 RKM/440 TKM
3	Location	:	Birlanagar-Etawah, Bhandai-Udi and Farrukhabad-Shikohabad including Mainpuri-Etawah of North Central Railway 386 RKM/440 TKM, Madhya Pradesh and Uttar Pradesh.
4	Address Detail	:	Birlanagar-Etawah section, Jhansi Division (Gr. 239) of North Central Zone of Indian Railway.
5	Nearest Railway Station	:	Agra, Etawah, Birlanagar, Shikohabad and others
6	Road Approach	:	NA
7	Nearest Air Port	:	Lucknow, Kanpur
11	Ambient Air Temperature (Average)	:	a) Maximum : 45^0 C b) Minimum : 2^0 C
12	Average Relative Humidity	:	60% to 80%
13	Climatic Condition	:	Tropical Climate
14	Rainfall & Raining period		Approx. 70 cm Annually (Monsoon Rain: June to September and Casual Rain: December to January). Thunderstorms during Monsoon.
15	Wind Pressure		155 kgf/sqm As per latest IS 875-1987

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

Chapter II- Scope of Work

SCOPE OF WORK

Traction sub-stations (TSS)

Supply, erection, testing and commissioning of single phase 132/25 KV, 50 Hz, AC Traction Sub Station (TSS), Feeding Post (FP), Shunt Capacitor Bank, series reactor along with all associated equipment including Foundations, Structures and all ancillary equipment, Earth mesh/electrode, Buried rail and connections etc. as per following details along with Earth work, construction of buildings, approach road, Laying of Cross Track along with sleepers & fastenings, points & crossings, ballast main work, retaining wall, Fencing, internal wiring, yard lighting, arrangement for water supply, All types of caution, warning, instruction, protection, location/Name and schematic diagram boards, Safety items (i.e. Firefighting equipment, First Aid box, Shock treatment chart, key box etc.), manning till stabilization of SCADA (At least for a period of 06 months from commissioning) and all necessary documentation for EIG sanction and CRS Inspection. Breakdown attention till CRS inspection. Proposed locations of TSS shall be as below:

Sl.No.	Location of TSS	Input Voltage	No. of Transformers	Capacity of Transformers	Starting Chainage	Ending Chainage	Size (LxW)
1	Bhind	132kV	2	21.6 MVA each	1306/547	1306/647	100x50
2	Malanpur	132kV	1	21.6 MVA each	1249/ 754	1249/804	50x100

25 KV Sectioning post (SP) and sub-sectioning post (SSP) (Switching Post)

Supply, erection, testing and commissioning of single phase, 25 KV, 50 Hz, AC Switching Stations (SP/SSP) including Foundations, Structures and all ancillary equipment etc. as per following details along with Earth work, construction of buildings, fencing, retaining wall, Internal Wiring with switch/fittings/equipments, Battery Set, All types of caution, warning, instruction, protection, location/Name and schematic diagram boards, earthing stations, Safety items (i.e. Firefighting equipment, First Aid box, Shock treatment chart, key box etc.), manning till stabilization of SCADA (At least for a period of 06 months from commissioning) and all necessary documentation for EIG sanction and CRS Inspection, breakdown maintenance till CRS inspection.
Proposed locations of SP/SSP shall be as below.

SL. No.	Location	Starting Chainage	Ending Chainage	Length	Width
Birla Nagar-Etawah Group-239					
1	Bhadrouli-SP	1234/00	1234/20.80	20.80 M	5.623 M
2	Sanichara-SSP	1242/182.20	1242/200	17.80 M	5.623 M
3	Nonera-H-SSP	1256/682.20	1256/700	17.80 M	5.623 M
4	Gohad Road-SSP	1268/100	1268/117.80	17.80 M	5.623 M
5	Sondha Road-SSP	1276/182.20	1276/200	17.80 M	5.623 M
6	Soni- SP	1284/00	1284/20.80	20.80 M	5.623 M
7	Itehar-SSP	1295/515	1295/532.80	17.80 M	5.623 M
8	Phuphu-SSP	1318/991.10	1319/8.90	17.80 M	5.623 M
9	Oodi-SSP	1329/532.20	1329/550	17.80 M	5.623 M
10	Etawah-SP	1339/65	1339/85.8	20.80 M	5.623 M

Modification of SP/SSP

Modification of SP/SSP at terminal locations, if required, shall be in the scope of contractor.

Chapter III- Facilities in the scope of BHEL/Contractor

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with customer(CORE)
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with customer(CORE)
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipment, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
f	Firefighting equipment like buckets, extinguishers etc.		Yes	
g	Fencing of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labor colony (as per availability)	Yes		Can be provided as per availability
b	Labor Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	Electricity For construction purposes		Yes	
3.2.2	Electricity for the office, stores, canteen etc. of the bidder		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	For construction purposes		Yes	
3.3.2	Water supply for bidder's office, stores, canteen etc.		Yes	
3.3.3	Water supply for Living Purpose		Yes	
3.4.0	**LIGHTING**			

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	

Sl. No	Description PART II 3.9.0 CONSTRUCTION FACILITIES	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.1	**Engineering works for construction:**			
a	Providing the construction drawings for all the works covered under this scope	Yes		
b	Drawings for construction methods			NA
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc. for reference and planning the activities		Yes	In consultation with BHEL
e	Preparation of construction (Concreting B/W, etc.) schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site construction schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly construction schedules based on S. No. e. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
h	Daily construction / work plan based on S. No. g. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
i	Periodic visit of senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two Weeks.		Yes	
j	Arranging the materials required for Work		Yes	
k	Coordination for inspection & checking and getting clearance from customer		Yes	
l	Preparation of formats for completion of activities		Yes	

Chapter IV- T&P's to be Deployed By Contractor

LIST OF TOOLS AND PLANT:

The following tools and equipment but not limited to, are required for the efficient execution of the works. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

S.No.	Description	Minimum Quantity	Remarks
A. For Works			
1	Hydra	1	Need based
2	JCB	1	Need based
3	Tractor	1	Need based
4	Cable unwinding Machines, rollers etc	1 No	
5	MC4 connector tool kit containing (1) crimping plier MC4, (2) open end spanner set MC4, (3) stripping plier MC4, (4) socket wrench insert to tighten, (5) socket wrench insert to secure, inserts for both 4 sq-mm and 6-sqmm (of both pliers).	2 Set	
6	Electrical measuring Instruments		
	a) Megger-1KV	1No	
	b) HV Tester-10KV	1No	
	d) Logic probe	1No	
	e) Modbus communication check kits	1No	
	f) Digital Multi meter	3 No	
7	Tong Testers	3 No	
8	Digital power meters	1 No	
9	Phase sequence meter	1 No	
10	OFC termination kit, Splicing kits	1 Set	
11	Primary /secondary injection kit	1 No each	Need based
12	Transformer oil filtration unit	1 No	Need based
13	Earth resistance measurement kit	1 No	
14	Lugs, glands as in scope of supply	1 set	Need based
15	Transmission line stringing equipment	1 No	
16	DG Sets	1 No	
17	Cable jointing kit and associated tools	2 Set	
18	Welding equipment	1 No	
19	Flood lights	5 No	
20	Set of screw drivers	1 Set	
21	Set of Allen keys (mm & inch)	1 Set	
22	Small size hacksaw & fraksaw	1 Set	

23	Cutting pliers	2 No	
24	Nose pliers	2 No	
25	Insulation stripers	2 No	
26	Dry cable jointer	1 No	
27	Number punches	1 No	
28	Alphabet punch	1 No	
29	Embossing machine with cassettes (Numbers and alphabets)	1 No	
30	Portable drilling machine up to 1-1/2”	1 Set	
31	Soldering gun	1 No	
32	Soldering Iron	1 No	
33	Continuity tester	5 No	
34	Double ended spanner Set of sizes 10-11, 12-13, 14-15, 16-17, 17-18	2 Nos each	
35	Screwdriver Set	1 Set	
36	Crimping tool with Dye range 50-400sq-mm cable, mechanical gear power, hand operated	1 Set	
37	Crimping tool up to 6 sq-mm cable	1 set	
38	Drilling machine AC, hand operated, with bit size up to 20 mm	1 set	
39	Measuring Tape, 5m	2 Nos	
40	Measuring Tape, 50 m	2 Nos	
41	Allen Key set	1 Set	
42	Adjustable spanner 2-inch size	1 No	
43	Hammer	2 Nos	
44	Rough file kit	1 Set	
45	Cutting Pliers	2 Nos	
46	Nose Pliers	2 Nos	
47	Vacuum cleaner, of industrial type, for control room sweeping / cleaning.	1 No	
48	Blowers for cleaning the panels	2 Nos	
B. For civil works			
1	Digital Concrete Mixer 2 to 4 cum with hopper/Self-loading mobile concrete mixer (Azax)with printer	2 nos.	
2	Needle Vibrator (Needle type 40mm)	4 nos.	
3	Needle Vibrator (Needle type 25mm)	2 nos.	
4	Dewatering Pump	2 nos.	
5	Earth Compactor	2 nos.	Need based
6	Theodolite with staff	2 nos.	
7	Dumpy level with staff	1 no.	

BHEL will not provide any tool, plants or any testing facility/apparatus for the work. It will be contractor's responsibility to arrange all required tools, plants and other testing apparatus, etc. at their own cost. The prices quoted & finalized are inclusive of the charges towards providing such T&P. No extra payment will be entertained on account of this.

Chapter V- Manning of TSS, SP, SSP

Manning of TSS, SP, SSP shall be done till stabilization of SCADA (at least for a period of 6 months from commissioning).

The prices shall cover the payment/wages to the staff to be deployed at each switching station and traction sub-station as directed by BHEL's Engineer. Manning shall be done round the clock. The staff to be deployed must be skilled and fully conversant with operation of various equipment installed in switching station and traction sub-stations. The staff shall be deployed after test and trial by BHEL/Railways and on issue of competency certificate. The staff deployed shall act in accordance with instructions/ directions given by Traction Power Controller/representative of BHEL/Railways. The staff shall not leave the working place (Switching station and Traction Sub-station) in any case without prior permission of BHEL's representative. The price shall cover conveyance charges to the staff for going and coming to the working place. The period of manning shall be decided by the BHEL/Railways during execution of contract and manning shall commence on receipt of intimation in writing from the BHEL/Railways one month in advance.

Chapter VI- Time Schedule

6.0 TIME SCHEDULE

6.1.1
The entire scope of work as detailed elsewhere in the Tender Specification shall be completed within **20 (Twenty) Months** from the date of commencement of work at site.

6.1.2
During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

6.1.3
The work shall be commenced on the mutually agreed date between the bidder and BHEL engineer. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer will be final.

6.3 MOBILISATION

6.3.1
The activities for this work shall be started as per directions of Construction manager of BHEL.
6.3.2
The contractor should mobilize man power in order to complete the work in **20 (Twenty) Months.**
6.3.3
Requisite Material, men and machinery should be arranged in order to complete the project within stipulated time period.
6.3.4
The contractor has to augment his resources in such a manner that following major milestones of the project are achieved on specified schedules:

In order to meet above schedule in general, and any other intermediate targets set, to meet project, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

6.4 CONTRACT PERIOD

For the purpose of contract, the period shall be taken as **20 (Twenty) Months** Completion of the work shall be as per BHEL Bar Charts revised from time to time. In order to expedite the work, the contractor has to deploy manpower as per site requirement without any extra cost to BHEL.

6.5 PROTECTION OF WORK

The contractor shall have total responsibility for protecting his works till it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.

If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

6.6 Project Milestones

i) **Milestone I**: Completion of all civil, supply and erection works of 1 TSS except supply and erection of Transformer (s) within 180 Days from zero date of contract.

(ii) **Milestone II**: Completion and Commissioning of all works in all respect including supply and erection of transformer(s) of 1 TSS , 2 SP, 3 SSP and charging at 25 KV, within 240 Days from zero date of contract.

(iii) **Milestone III**: Completion and Commissioning of all works in all respects of 2 TSS, 3 SP, 7 SSP cumulatively and charging at 25 KV, within 420 Days from zero date of contract.

(iv) **Manning:** Manning of TSS, SP and SSP shall be done after commissioning of respective TSS, SP and SSP's as per chapter V.

Locations of the respective TSS, SP and SSP's, for the purpose of work execution w.r.t. milestones shall be informed later by BHEL Site-In charge.

Chapter VII- Storage and Security

Contractor shall take all necessary measures to prevent any theft, pilferage of BHEL's supplies and as well as contractor (s) supplies. In order to achieve this following shall be required to be adhered with:

1. **Storage and security of contractor supplies:** Contractor shall be responsible for storage and security of works & supplies (Which are in his scope) till contract completion or handing over of project to Railways whichever is later.
   1.1 Contractor shall file FIR in case of any theft for record and purpose of insurance claim.
   1.2 Contractor shall liaison with insurance company and provide all necessary documents in order to facilitate insurance claim.
   1.3 Contractor shall keep sufficient security to prevent any kind of theft/damage at works during contract execution.
   1.4 In case of any theft, pilferage, damage or loss of any material, contractor shall replenish the same without any additional cost to BHEL without any time delay.

2. **Storage and security of BHEL supplies:** BHEL shall be responsible for storage and security of supplies (Which are in BHEL's scope) till handing over of the material to contractor from BHEL's store.
   2.1 Contractor shall draw materials supplied by BHEL* from BHEL's store after due permission from store's in charge.
   2.2 Contractor shall be responsible for transportation (and damage etc. thereafter) of supplies from BHEL stores to works or their respective stores.
   2.3 Contractor shall file FIR in case of any theft for record and purpose of insurance claim.
   2.4 Contractor shall liaison with insurance company and provide all necessary documents in order to facilitate insurance claim.
   2.5 In case of any theft, pilferage, damage or loss of any material, contractor shall replenish the same without any additional cost to BHEL without any time delay. In case contractor fails to replenish the material within stipulated time, BHEL shall supply the material and cost of the same shall be recovered from contractor.
   In case of successful claim of insurance, same shall be passed on to the contractor.
   2.6 No extra payment for security shall be paid to contractor by BHEL as contract price is inclusive of all.
   2.7 Following are the tentative store locations of BHEL
   a) Bhind (M.P)
   The above locations are subject to approval by Railways, finalized locations shall be informed by BHEL later.

*Except Traction Transformers, which shall be directly supplied to TSS location. Unloading and material handling of traction transformer shall be in the scope of contractor.

Chapter VIII- Statutory Regulation

1. BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998 and INTER-STATE MIGRANT WORKMEN ACT, 1979 (IN CASE BIDDER ENGAGE MANPOWER FROM OTHER STATE)

In case any portion of work involves execution through building or construction workers and/or inter-state migrant workmen, then compliance to the above titled Acts as applicable shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-

It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and/or ISMW Act as applicable and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these acts and rules including that of payment / deposit of cess as per the applicability under above referred Acts within a period of one month from the receipt of payment.

It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building/Inter-state Migrant workmen) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

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Part II
Technical Specification
OHE Works

Chapter I- Intent of Specification

1.0 INTENT OF SPECIFICATION

This specification covers the supply, Erection, Testing and Commissioning of 132kV/25 kV Single Phase AC, 50 Hz, Traction Sub-Stations (TSS) including Control Room Building, Feeding Post, Shunt Capacitor banks and Switching Posts (SP/SSP) including Control Cubicles for the Electrification of Railway Lines of the sections Birlanagar-Etawah, Bhandai - Udi and Farrukhabad - Shikohabad including Mainpuri - Etawah of North Central Railway 386 RKM/440 TKM.

It is not the intent to specify completely herein all details of the equipment; nevertheless, the Overhead Equipment System shall be complete and operative in all respects and shall confirm to the highest standard of engineering, design and workmanship.

Chapter II- System Description

2.0 SYSTEM DESCRIPTION

2.1 System Particulars of Traction Sub-Stations

2.1.1 The incoming Electrical Power shall be received at the gantry of Traction Sub-Station from the nearest Grid Sub-Station by the authorities. The supply to the transformers will be controlled through single phase double pole circuit breakers. One terminal of secondary side the transformers will be solidly earthed and connected to the buried rails and nearest running tracks, the other terminal of the secondary side of the transformer shall be connected to the 25 KV bus through single phase single pole circuit breakers and associated isolators. From the bus bars 25 KV supply will be extended to feeding station through circuit breakers called feeder circuit breakers. Normally, the traction substation will be located alongside the Railway track. The feeding stations will be located within the substation boundary and connected to the traction substation by extension of the 25 kV bus bars. Where the traction substation is located some distance away from the track, the 25 kV supply will be extended to the feeding station by means of two overhead feeders carried on tower/masts. Each feeder line will comprise two conductors one called the 25 kV feeder and the other return feeder.

2.1.2 In order to keep the supply from two adjacent sub- stations separate, a neutral section is provided on the traction overhead equipment approximately midway between them. The neutral section is normally kept dead. Electric locomotives coast through the neutral section with power off.

2.1.3 At the feeding station, the 25 kV supply will be fed to different sections of the traction overhead equipment by means of interrupters. All interrupters will be remote controlled.

2.1.4 The traction sub-stations, will normally be unattended and all switching operations will be carried out by remote control from a Remote Control Centre through SCADA. However, Traction Sub-Stations shall be manned till stabilization of SCADA (At least for a period of 6 months from commissioning).

2.1.5 A small masonry building called the control room will be provided at each substation as per RDSO standards to house the control and instrument panels, remote control equipment, batteries, battery chargers, telecommunication terminal equipment, telephones and AC and DC LT distribution boards.

2.1.6 Fire protection baffle wall will be provided in between the two bays of the power transformers per IS/RDSO standards

2.1.7 The capacitor bank shall be of outdoor type, mounted on steel racks for connection to the 25kV bus through single pole isolator and circuit breaker. The capacitor bank shall consist of groups of individual capacitor units, connected in series parallel combination to deliver the rated output, at normal rated system voltage, rated frequency and other rated system conditions. The control panel for the capacitor bank shall be installed inside the control room of the traction sub-station.

2.1.8 **Series reactor (Harmonic suppression reactor):** A series reactor shall be provided to limit the inrush current and surge voltage at the time of switching in the capacitor bank. The switching surge voltage shall not exceed 70 kVP. The series reactor which is also meant to filter a part of the harmonics generated by the traction loads shall have inductive reactance (X L) equal to or greater than 13% of capacitive reactance (X C) of the capacitor bank. The series reactor shall be natural air cooled, air Cored, dry insulated and outdoor type. The reactor shall

be rated for maximum current including harmonic current that would flow through the capacitor bank under operating condition.

2.1.9 The entire traction substation and the control room will be protected by a fenced enclosure. A Railway siding from the nearest Railway station will be terminated inside each substation, where feasible, to enable unloading of heavy equipment at site. Road access will also be provided wherever possible.

2.1.10 Every feeding station has a gantry with two or more main masts (Up-right). The interrupters are located behind the gantry. Isolators, Potential Transformers, station class lightning Arrestors and pedestal Insulators are mounted on a gantry. From the gantry, connections are made to various sections of overhead equipment by cross feeders and jumper connections. Feeding stations are unattended and remote controlled from a remote control center (see part-III). Feeding stations will be located within the traction sub-station premises. Control equipment, S&T terminal equipment, arrangement for termination of cables from feeding station equipment will be provided inside the sub-station control room.

2.1.11 **AUXILIARY SUPPLIES** : The following auxiliary supplies shall be provided at each traction sub-station

- 110 V, 200 Ah battery for operation of switchgear
- Single phase 240 V AC supply

2.2 System Particulars of Switching Stations (SPs & SSPs)

2.2.1 Power supply will be controlled to the different sections of traction overhead equipment by switching stations. At these stations the switching will be effected by means of "Interrupters" which are single pole, non-automatic oil circuit breakers capable of repeatedly interrupting normal full load current.

2.2.2 Every switching station has a gantry with two or more main masts (Up-right). The interrupters are located behind the gantry. Isolators, Potential Transformers, station class lightning Arrestors and pedestal Insulators are mounted on a gantry. From the gantry, connections are made to various sections of overhead equipment by cross feeders and jumper connections.

2.2.3 Switching stations are unattended and remote controlled from a remote control centre. However, Switching Stations shall be manned till stabilization of SCADA (At least for a period of 6 months from commissioning).

2.2.4 A small masonry cubicle, called the control cubicle, shall be constructed at each switching station to house control equipment, batteries, battery charger, S&T, terminal equipment, a terminal board for terminating cables from the switching station equipment, a telephone and telephone equipment and A.C. 240V distribution board as per RDSO standards. In the case of the Feeding stations that are located within the Traction sub-stations premises, all the above equipment will be provided inside the sub-station control room. The switching station and its control cubicle shall be enclosed by fencing.

There shall be two types of switching stations:-

- **Sectioning stations (SP):** The sub-stations cannot, as a rule be paralleled and consequently a neutral section of overhead equipment with insulated overlaps on either side will be provided approximately midway between two consecutive feeding stations. Neutral sections may also be provided at feeding

stations. Facilities to bridge the neutral section between feeding stations will be provided at sectioning stations.

- **Sub-sectioning stations (SSP)**: In order to facilitate maintenance of overhead equipment and to permit isolation of faulty sections and expeditious restoration of power supply in healthy sections, sub-sectioning stations with insulated overlaps will be provided between the feeding stations and the sectioning stations.

Chapter III- Project Details

3.0 Project Details

3.1 Details of the proposed Locations of TSS/SP/SSP and Scope of Work shall be referred in Chapter II, Vol IA of this TCC.

3.2 Proposed Power Supply Diagrams, Location Plans, Sectioning Diagrams and Wiring Diagrams are also attached along with this specification.

(The drawings enclosed with this tender are intended to give the bidder a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings. Further, this is to be noted that the drawings and the documents furnished along with this specification are the sole property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company)

Chapter IV- General Conditions of this Specification

4.0 General Conditions of this Specification

Specifications and Standards

4.1.1 The Contractor shall comply with Indian Railways Manual AC Traction (Volume-II Part-I and Volume-II Part-
II), Manual of Standards & Specification for Railway Electrification, Indian Railways Schedule of Dimension for construction of the Railway Electrification Project. It includes verification and validation of system installed and independent certification for maintenance and operation system during its life cycle.

4.1.2 The Railway Project shall conform to design requirements set out in the following documents:

Indian Railways Permanent Way Manual, Indian Railway Bridge Manual, Indian Railway Schedule of Dimensions & relevant IRS Specifications referred in the Manual, Indian Railway Signalling Engineering Manual, Indian Railway Telecom Manual, AC Traction Manual, Rules for Opening Railways

4.1.3 The contractor shall follow latest RDSO specifications as on 31.10.2018 for procurement of materials and execution works.

The contractor is also expected to get conversant with latest RDSO, CORE, ACTM & other railway standards/manuals/guidelines and drawings. All works shall be strictly executed as per railway standards and drawings.

The Purchaser shall provide project specific drawing / documents like General Arrangement Drawings, Layouts etc. for the execution of work, however, any standard RDSO/CORE/Railways drawings/guidelines/specification/manual required for procurement and execution of the project shall be arranged by the Contractor on his own risk and cost. The contractor shall not delay any execution activity on account of non-availability of any such standard documents with them.

In case of any discrepancies in the approved documents/execution of work with respect to RDSO/CORE/Railway standards, specifications and guidelines, it shall be responsibility of the contractor to inform the same to the purchaser before executing the work in order to take up with the authority.

4.1.4 Any calculations, designs, drawings, schedules, information, data, progress charts etc. required by the Authority's Engineer in connection with the contract shall be furnished by the Contractor at his own expenses.

4.1.5 In the absence of any specific provision on any particular issue in the aforesaid Manuals, Specifications, or Standards, the following standards shall apply in order of priority

- Bureau of Indian Standards (BIS)
- Euro Codes or British Standards or American Standards
- Any other specifications/standards proposed by the Contractor and reviewed by the Authority's Engineer.

4.1.6 The requirements specified in the Manuals are the minimum. The Contractor shall, however, be free to adopt international practices, alternative specifications, materials and standards to bring in innovation in the design and construction provided they are better or comparable with the standards prescribed in the Manuals. The specifications and techniques which are not included in the Indian Railway Manuals/ RDSO specifications shall be supported with authentic specifications and standards specified in 5.1.5 above. Such a proposal shall be submitted by the Contractor to the Authority/Purchaser. In case, the Authority's Engineer is of the opinion that the proposal submitted by the Contractor is not in conformity with any of the international standards or codes, then he shall record his reasons and convey the same to the Contractor for compliance.

Supply of the Material:

4.1.7 All the items supplied by the contractor shall be as per RDSO/CORE Vendor List. In case of non-availability of vendor list for any item, the contractor shall inform the same to the purchaser/railway for approval.

4.1.8 The contractor shall submit and also liaison for approval from the Authority for the GA/Installation drawings/approved QAP or any other drawing applicable for equipment to be supplied by the contractor. The contractor shall also submit any other drawing as required by the Authority for approval/information.

4.1.9 The contractor shall submit the necessary drawings/documents in 3 copies each for review with reasonable promptness and in such sequence as is consistent with the project completion schedule.

4.1.10 The contractor shall submit a material procurement plan within 10 days from the date of LOA for information. The material procurement plan shall be prepared strictly in accordance with the Project Milestones.

4.1.11 The Contractor shall proceed with the ordering of supply of material after taking due Approval from the purchaser.

4.1.12 The Contractor shall be responsible for considering basic quantities of components and materials required to make up a unit of work for complete TSS, SP, SSP and other items of this contract.

4.1.13 The Purchaser/Authority shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

4.1.14 No later than 90 (ninety) days prior to the Project Completion Date, the Contractor shall, in consultation with the purchaser, evolve an equipment specific maintenance manual for equipment based on a new technology not currently in use in the Railways (the "Maintenance Manual") for the regular operation and maintenance of such equipment in conformity with safety requirements, Good Industry Practice and manufacturer's manuals and instructions and shall provide 10 (ten) hard copies and 2 (two) compact discs thereof to the purchaser.

4.1.15 Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer/Purchaser shall obtain a complete set of as-built Drawings, in 3 (three) hard copies and in its editable digital format or in such other medium as may be acceptable to the Authority, reflecting the Railway Project as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Railway Project and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.

4.1.16 The following items only shall be free issued by the Purchaser to the contractor at the purchaser's stores

a. 132kV/27kV, 21.6/30.24MVA Traction Power Transformers for TSS**
b. 132kV SF6 Circuit breaker for TSS
c. 25kVA and 10kVA Auxiliary Transformers for TSS and SP/SSP respectively
d. Battery Chargers for 110V, 200AH and 110V, 40AH Batteries for TSS and SP/SSP respectively
e. 25kV Vacuum Circuit Breakers and 25kV Vacuum Interrupters for TSS, SP, SSP.

**Transformers shall be unloaded by the contractor at its own expenses at the locations specified by and under the guidance of the Engineer-in-Charge at Site.

Services

4.1.17 The Contractor shall provide and complete the training to the personnel of the Purchaser/Authority in diagnostic, trouble shooting, repairing, operation and maintenance of the Power Supply Installations at work site. The number of persons to be trained shall not exceed 10 (ten) and the period of training shall be for a period of 4 (four) weeks. The training shall be completed before the issuance of the Provisional Certificate/ Completion Certificate.

Spares

4.1.18 The contractor shall retain sufficient spares at project for prompt replacement, installation or re-installation of any defective parts of TSS, SP, and SSP for defect liability period.

Terminal Points

4.1.19 With respect to incoming power supply from Grid, the 132kV transmission line from GSS to TSS shall be by the authority, however necessary terminations at TSS end shall be in the scope of the contractor.

4.1.20 With respect to Overhead Equipment, the contractor scope shall be up to gantry/main mast of the Feeding Station. Complete supply and Erection of Feeding Station shall be in the scope of the contractor. Termination of feeder/return conductor at Feeding post from nearest overlap/neutral section is excluded from the scope of the contractor.

It shall be responsibility of the contractor to provide timely front of feeding post for connections of feeder/return conductor. In case of time delay at contractor's account, the final terminations shall be done by the contractor free of cost, however, necessary materials for termination shall be supplied by the OHE contractor.

4.1.21 With respect to SCADA equipment in TSS/SP/SSP, the contractor shall provide space in control buildings, power supplies etc. for successful commissioning of the SCADA by the SCADA contractor. All the terminations at SCADA end shall be excluded from the Scope of the contractor but any termination at any equipment, which is to be erected by the contractor shall by in the scope of the contractor.

It shall be responsibility of the contractor to provide timely front to SCADA contractor for installation of SCADA equipment. In case of time delay at contractor's account, the final terminations shall be done by the contractor, however, necessary materials for termination shall be supplied by the SCADA contractor.

4.1.22 With respect to S&T contractor:
Signaling & Telecommunication (S&T) contract will provide the Quad / OFC cables up to RC Terminal Box required for SCADA RIO panels, telephone sets located within the TSS/SP/SSP Control building.

4.1.23 All the civil and its allied works defined in this specification for TSS, SP, and SSP shall be in the scope of the contractor. However, for water supply/ sewerage system requirement in TSS, the contractor shall complete necessary works inside control room building and other areas inside TSS boundary and will connect its pipes (along with necessary fittings) to the provision of water supply/ Sewage system provided at nearest available point as per direction of Engineer in charge.

Packing and Dispatch

4.1.24 Packing and Dispatch of materials shall be as per RDSO/CORE/Railway standards.

Chapter V- Explanatory Notes

5.0 Explanatory Notes for TSS, SP, SSP

5.1 General

5.1.1 Explanatory notes for various Items of work mentioned in Price Format are provided in 6.0.

5.1.2 Wherever an item of work covers supply of materials and/or erection, such items shall include all bolts, nuts, locknuts, washers etc. also.

5.1.3 The equipment and materials to be supplied by the Contractor against various items should conform to standard RDSO's specification and drawings.

5.1.4 Erection of any item of equipment, whether supplied by the Contractor or by the Purchaser will include proper connecting, testing, commissioning and bringing the equipment into operation in accordance with standards/guidelines and to the satisfaction of the Purchaser.

5.1.5 Special notes for measurements are included in of this Chapter under various items, where necessary.

5.1.6 All the materials supplied by the Purchaser shall be correctly accounted for and quantities reconciled on completion of the work by the Contractor. On completion of the work all surplus materials supplied by the Purchaser together with ones found defective or that have become defective or broken on account of defective materials and/or Workmanship shall be returned to him by the Contractor.

5.1.7 The scope of work will also include such other related works although they may not be specifically mentioned in this specification and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.

5.2 TSS – Traction Substation Particulars (Excluding Civil and Illumination Works)

Item No. 1: Deleted

Item No. 2 Supply, Erection, Testing and Commissioning of Steel Structures:

2.01 Rolled traction masts galvanized steel structures

The price shall cover cost of supply and erection, at respective site / locations, as per RDSO drawing of individual RSJ Mast, rolled traction masts, B-series mast, Dwarf masts and other type of masts. For the purpose of payment, the weights of individual traction mast shall be determined for each type on the basis of the payable weights per meter length and per meter weights given in tables of Railways [as per respective RDSO drawing for standard types]. For special types, the payable weight per meter length will be decided by the Purchaser, at the time of approval of designs. The galvanization should be as per respective RDSO drawing/standard.

2.02 Fabricated & galvanized steel structures

The price shall cover cost of supply and erection, at respective site / locations, as per RDSO drawing of individual fabricated & galvanized steel structures. For the purpose of payment, the weights of individual traction mast shall be determined for each type on the basis of the payable weights per meter length and per meter weights given in tables of Railways [as per respective RDSO drawing for standard types]. For special types, the payable weight per meter length will be decided by the Purchaser, at the time of approval of designs. The galvanization should be as per respective RDSO drawing/standard.

2.03 Fabricated & galvanized steel work other than masts including SPS

The price shall cover the cost of supply and erection of all galvanized fabricated steel work including fasteners other than items in 2.01 and 2.02 which are required to be supplied by the Contractor. For standard fabricated steel work for which RDSO's drawings are available, the weight of steel work as specified in RDSO's drawing shall be considered for payment. However, in case the unit sectional weight of any member indicated in RDSO's drawing is not in conformity with the unit sectional weight as per the latest IS specification, the weight of the fabricated steel work shall be calculated on the basis of latest IS Specification and the same will be considered for payment. For the non-standard fabricated steel work, the calculated weight to be considered for payment under this item shall be included in the relevant drawing based on latest IS sectional weight at the time of submitting the designs for approval of the Purchaser. The galvanization should be as per respective RDSO drawing/standard. The price shall cover painting with primer and finish paint as required.

Notes for Items No. 2:

i. The price shall cover cost of erection, alignment, setting before grouting, wherever required, tower/steel tower/steel work for feeders for TSS/SP/SSP, drop arms, MS Angles, Channels, standard super mast, stub masts for anchoring, complete with anchor plates drilled and welded in position, multiple cantilever cross arm, chairs, adopters for bracket assemblies and all other small part steel works, the erection of which shall also carried out by the contractor. The price shall also include supply and erection of galvanized bolts, nuts washers etc. wherever required as per approved design and drawings. The price shall also include the cost of repairing of platform shelters in case the shelter is dismantled/damaged during the course of erection of a mast/portal at platforms.
ii. There will be no addition for increased weight due to galvanizing or painting or weld material or reduction for holes or skew cuts. The price shall cover shifting / transportation of each masts up to individual locations.
iii. Unless specifically indicated none of the other items of work shall include the cost of supply and / or erection of small part steel work, which will invariably be paid for under item 2.03 as applicable respectively.
iv. All Galvanized / SS bolts, nuts, lock nuts and washers required for assembly and fastening of steel work mentioned against item No. 2.02 and mounting of the above equipments in gantries shall be supplied by the Contractor.
v. The price shall also include the straightening of masts/portal uprights bent during transit and cutting of masts/portal uprights to suit the site conditions. The payment shall be made on the basis of final lengths/weights of the masts/structures in case the same are cut/modified as indicated above before erection. In case cutting of mast or worn out galvanization, application of cold galvanization paint at the site shall be done by the contractor immediately.

Item No. 3: Erection, Testing and Commissioning of 132 KV Double Pole SF-6 Gas Circuit Breakers

The price shall cover erection of 132 KV double pole SF-6 Gas Circuit Breakers, complete with operating mechanism, all fittings and accessories including terminal connectors. The price shall cover grouting the

supporting frame and Mechanism box on foundations block and mounting of other accessories in their respective places. It shall also cover first gas filling (gas required for first filling shall be supplied by the Purchaser), testing and commissioning of the circuit breaker. The Contractor shall make his own arrangement for filling of the SF-6 gas and power supply required for testing purpose. All necessary tools, equipments, instruments required for carrying out necessary checks, tests and commissioning shall be arranged by the Contractor. Supply of 25kV Single pole circuit breaker is not in bidder scope.

Item No. 4: Supply, Erection, Testing and Commissioning of 132 KV Double Pole Isolators (Manually operated)

The price shall cover supply & erection and connecting up of a 132KV single phase double pole Isolator with manually operated mechanism complete with mounting base and all accessories/ required for its operation including terminal connectors. The price shall include supply and erection of padlock. The price shall include mounting of the Isolator and the operating rod in position and their alignment for smooth and trouble free operation. The prices shall also include the cost of operating rod. 132 KV Double Pole Isolators (Manually operated) shall conform to RDSO specification.

Item No. 4.01: Additional Items for Supply and Erection of earthing blade assembly of 132 kV double pole isolator (manually operated)

The price shall cover supply and erection of earthing blade assembly for 132KV Isolators. The price shall be extra on item 4 and applicable individually for each Isolator.

Item No. 5: Supply, Erection, Testing and Commissioning of 132 KV Current Transformers

The price shall cover supply & erection and connecting up of a 132KV Current Transformer complete with all fittings and accessories including terminal connectors. It shall also include mounting of the transformer in position. 132 KV Current Transformers shall conform to RDSO specification.

Item No. 6: Supply, Erection, Testing and Commissioning of 132 KV Potential Transformers

The price shall cover supply & erection and connecting up of a 132KV Potential Transformer complete with all fittings and accessories including terminal connectors. It shall also include mounting of the transformer in position. 132 KV Potential Transformers shall conform to RDSO specification.

Item No. 7: Supply, Erection, Testing and Commissioning of 132 KV Lightning Arrestors

The price shall cover supply & erection and connecting up of a 132KV Lightning arrestor with surge counters complete with all fittings and accessories including terminal connector. It shall also include mounting of the Lightning arrestor in position. 132KV Lightning Arrestors shall conform to RDSO specification.

Item No. 8: Erection, Testing and Commissioning of 25 KV single Pole Vacuum Circuit Breaker

The price shall cover erection of 25kV Vacuum Circuit breaker, complete with operating mechanism, all fittings, and accessories including terminal connectors. The price shall cover grouting the supporting frame and mechanism box on foundation block and mounting of other accessories in their respective places. It shall also cover testing and commissioning of the circuit breaker. All necessary tools, equipments instruments required for carrying out necessary checks and tests and commissioning shall be arranged by the Contractor.

Item No. 9: Erection, Testing and Commissioning of 25KV Vacuum Interrupters

The price shall cover erection of 25 KV Vacuum Interrupters complete with operating mechanism, all fittings and accessories including terminal connectors. The price shall cover grouting the supporting frame and mechanism box on foundation block and mounting of other accessories in their respective places. It shall also cover testing and commissioning of the Interrupters. The Contractor shall make his own arrangement for power supply required for testing purpose. All necessary tools, equipments and instruments required for carrying out necessary checks, tests and commissioning shall be arranged by the Contractor.

Item No. 10: Supply, Erection, Testing and Commissioning of 25KV isolators

10.01: 25kV Single Pole Isolators (1600A)

The price shall cover the supply and erection, alignment and connecting up 25kV Single Pole Isolator complete with mounting base, operating rod, operating mechanism, necessary interlock mechanism and all accessories required for its smooth and trouble free operation. The price including solid core Post Insulator etc. shall also cover supply a pad lock for each Isolator. Bus bar connector provided for making connection to Isolator terminal pad shall be paid under item 20. 25kV Single Pole Isolators (1600A) shall conform to RDSO specification.

10.02: 25 kV Double Pole Isolators (1600A)

Same as for item 10.01 above except that the price shall cover supply and erection of double pole Isolator instead of single pole Isolator.

10.03: Additional Items for erection of Interlocking Mechanism for isolator

The price shall cover erection of an Interlocking Mechanism on an Isolator to permit working of an Isolator and or earthing blade assembly in a desired sequence. The price shall be extra on items 3, 4, 8, 9, 10.01, 10.02 and shall be applicable individually for each Isolator, Circuit Breaker and Interrupters.

Item No. 11: Supply, Erection, Testing and Commissioning of 25 kV Potential Transformers (Type-II)

The price shall cover supply & erection and connecting up of a 25KV Potential Transformer complete with all fittings and accessories including terminal connectors. It shall also include mounting of the transformer in position. Bus-bar connectors provided with jumper connections shall be paid under item 20. 25KV Potential Transformers (Type-II) shall conform to RDSO specification.

Item No. 12: Supply, Erection, Testing and Commissioning of 25KV Potential Transformers (Type-I)

The price shall cover supply & erection of a 25KV potential transformer type-I complete with all fittings and accessories as per relevant specification including terminal connectors and fixing bolts. The price for supply and erection shall include proper alignment of the transformer in position. The price shall not include the cost of any small parts steel work. 25KV Potential Transformers (Type-I) shall conform to RDSO specification.

Item No. 13: Supply, Erection, Testing and Commissioning of 25 KV Current Transformers (1500-750/5)

The price shall cover supply & erection and connecting up of a 25KV Current Transformer complete with all fittings and accessories including terminal connectors. It shall include mounting of the transformer in position. 25KV Current Transformers (1500-750/5) shall conform to RDSO specification.

Item No. 14: Supply, Erection, Testing and Commissioning of 42 KV Lightning Arrestors

The price shall cover supply & erection of a 42KV Lightning Arrestor complete with all fittings and accessories including terminal connector. It shall also include mounting and connecting up of the Lightning Arrestor in position. 25KV Lightning Arrestors shall conform to RDSO specification.

Item No. 15: Erection, Testing and Commissioning of Control & Relay panel (board) for 25 kV TSS

The price shall cover erection and connecting up of Control Boards with Numerical type relays as per RDSO Specification (Comprising of distance, wrong phase and instantaneous over current protection with PT fuse failure) for OHE protection, transformer protection, OHE protection ,auto reclosing scheme and Shunt capacitor banks manufactured by any RDSO approved firms, for all the 132KV and 25KV Circuit Breakers, Interrupters, Isolators and Transformers at the traction substations complete with all wiring, control switches, meters, protective and auxiliary relays etc. including mimic panel. The price for erection shall also include alignment and grouting of the panels in position and all necessary connections to bring the control board to operation. It shall also include the cost of connecting the frame of each control panel to the earth bus inside the control room. The prices for erection of Control & Relay panel shall include erection and connecting up of Panto flashover protection relay as per RDSO specification.

The prices for erection of Control & Relay panel shall include erection and connecting up of Delta-I type fault selective relay (2 Nos.) as per RDSO specification.

Item No. 16: Erection, Testing and Commissioning of 25 KV/240 V Auxiliary Supply Transformer (25 kVA capacity) Oil type along with hardware

The price shall cover erection, testing and commissioning of 25 KVA L.T. Supply transformer complete with all fittings and accessories including terminal connectors. The price shall include supply and erection of 5 SWG copper jumper wire required for connecting and also include mounting of the transformer on its supporting structure. The price shall also cover oil filtration, testing and commissioning of the transformer. The Contractor shall make his own arrangement for oil filtration plant as well as power supply for the same.

Item No. 17: Supply, Erection, Testing and Commissioning of 25 KV Drop out fuse switches for 25 KVA Auxiliary Supply Transformer

The price shall cover supply & erection, and connecting up of 25KV drop out fuse switches for 25 KVA capacity Auxiliary Supply Transformers complete with all mounting accessories including terminal connectors. It shall also include the erection of insulators, operating pole and fuse links. 25KV Drop out fuse switches for 25 KVA Auxiliary Supply Transformer shall conform to RDSO specification.

Item No. 18: Supply, Erection, Testing and Commissioning of Tubular Aluminium bus-bars 50 mmx39 mm dia

The price shall cover supply and erection per meter length of 50x39mm dia. Aluminium tube to serve as bus bar or equipment to equipment bus-bar connection in the traction sub-station, wherever required. The price shall include bending, shaping and connecting/ clamping of the Aluminium tube to the equipment terminals/bus-bar supports as required.

Item No. 19: Supply, Erection, Testing and Commissioning of `ZEBRA' ACSR Conductor

The price shall cover supply and erection per meter length of 61/3.18 mm (ZEBRA ACSR) conductor to serve as bus-bar or equipment to equipment/bus-bar connection in the traction sub-station, wherever required. The price shall include straightening, shaping and connecting/clamping of the conductor to the equipment terminals/bus-bar supports as required.

Item No. 20: Supply, Erection, Testing and Commissioning of Terminals and connectors

The price shall cover supply and erection of a bus-bar junction, terminals and connector of the type specified, including bolts, nuts, lock nuts, washers etc. required at the junction of bus-bars. The price shall also include supply and erection of `ALCU' strip if required to be provided at the junction.

Note for item 18, 19, 20:

For purpose of payment for items 18 and 19 fraction of a meter in the total length used at a sub-station shall be rounded off to the nearest meter (0.5m and below being ignored).

For purpose of payment, the length of aluminium conductor strung as bus bar between gantries shall be taken as horizontal distance between the interfaces of the gantries. The total length used at a sub-station shall be rounded off to the nearest meter (0.5 m and below being ignored).

Item No. 21: Supply, Erection, Testing and Commissioning of Aluminium bus-bar of 36 mm x 28 mm

The price shall cover supply and erection of Aluminium bus-bars 36mm x 28 mm including bending, shaping and clamping on to insulators, connectors or equipment terminals.

Note for item 21:

The price under item 21 does not cover the cost of terminal connectors which will be paid for under item 18 and 20 as applicable.

Item No. 22: Supply, Erection, Testing and Commissioning of all Aluminium 25 KV feeder/return conductor

The price shall cover supply and erection of Hard-drawn stranded All Aluminium conductor feeder/return conductor (along or across the tracks) as per RDSO Specifications including 3kV disc Insulators along with all necessary accessories, fittings, bolts, nuts, washer, clamps, connectors complete with bolts and nuts etc. The price shall not include the cost of suspension insulator (which will be paid for under item 23.07) and termination (which will be paid for under item 23.05 and 23.06, as applicable) and small part steel work (which will be paid for under item 2.03), the price shall also cover on a flat rate basis, the cost of supply of splices to the extent required.

Item No. 23: Supply, Erection, Testing and Commissioning of terminations and insulators:

23.01: 132 KV Support Insulators

The price shall cover supply and erection of 132KV support insulators complete with fixing bolts, nuts and studs. Bus-bar/ jumper clamps for clamping the bus-bar shall be paid under item 20.

23.02: 25 kV Support Insulators with hardware

The price shall cover the supply and erection of a 25kV solid core post insulator to support Aluminium bus-bars. It shall include supply of fixing bolts, nuts, locknuts, washers and studs etc. It shall also cover-erection of all components required for the assembly including post insulator. Bus-bar clamps/jumper clamps for clamping the bus-bars/jumpers shall be paid under item 20.

23.03: 132 kV Termination with Disc Insulators with adjuster

The price shall cover supply and erection of all materials for the termination of a single ACSR conductor (61/3.18 mm ZEBRA) strung between gantries/portals, including anchor fittings, single clevis assembly, adjuster, anchor double straps, string ring of 10nos. of 280mm (11") Disc Insulators strain clamps and arcing and other fittings to complete the assembly. The assembly shall be of breaking strength of not less than 11500 kgf.

23.04: 132 KV Terminations with Disc Insulators without Adjuster

The price shall cover supply and erection of all materials for the termination of a single ACSR conductor (61/3.18 mm ZEBRA) strung between gantries/portals, including anchor fittings, single clevis assembly, anchor double straps, string of 10nos. of 280mm (11") Disc Insulators, strain clamps and arcing ring and other fittings to complete the assembly. The assembly shall be of breaking strength of not less than 11500 kgf.

23.05: Materials for termination of all Aluminium 25 KV feeder/return conductor with 9T porcelain insulators

The price shall cover supply of all materials required for the termination of an All-Aluminium 25 KV feeder/return conductor (SPIDER), including appropriate mast anchor fittings adjuster, strain clamp end fitting including 3 KV cut-in-insulator and 9 ton insulator assembly. The price shall cover supply and erection of all materials including the 9 ton insulator assembly and 3 KV cut-in-insulator. The price shall cover supply of 9 tonne insulator assembly required for termination of All Aluminium 25KV feeder/return conductor.

23.06: Materials for termination of all Aluminium 25 KV feeder/return conductor with 9T composite insulators

The price shall cover supply of all materials required for the termination of an All-Aluminium 25 KV feeder/return conductor (SPIDER), including appropriate mast anchor fittings adjuster, strain clamp end fitting including 3 KV cut-in-insulator and 9 ton insulator assembly. The price shall cover supply and erection of all materials including the 9 ton insulator assembly and 3 KV cut-in-insulator. The price shall cover supply of 9 tonne insulator assembly required for termination of All Aluminium 25KV feeder/return conductor.

23.07: Solid core suspension Insulators along with hardware

The price is applicable to the provision of a 9 tonne suspension insulator assembly for suspension of an all-Aluminium 25 kV feeder (Single or Double SPIDER) or any other similar type of suspension. The price shall cover supply of all components required for the suspension assembly including the appropriate suspension clamps and the 9 tonne insulator assembly but excluding small parts steel work with bolts and nuts etc., if any. The price shall cover erection of all components, including the 9 tone insulator assembly but excluding small parts steel work with bolts and nuts etc., if any. The price shall include the cost of provision of a flat armour tape only to be used in connection with suspension of "SPIDER" conductor.

Item No. 24: **Supply, Erection, Testing and Commissioning of Jumpers:**

24.01: 105sqmm large copper jumpers

The price shall cover the supply of Large jumper wire size 105 Sq.mm as per RDSO's specification and on a flat rate basis, the supply of all components and fittings required for providing a flexible copper large jumper connection, including supply of parallel clamps, bi-metallic and Aluminium Copper Al-Cu strips, wherever required, and bolted type terminal connectors where ever required.

The price shall also cover the erection of the complete jumper assembly including jumper wire. The price shall not, however, be applicable for jumper connections already including under other items.

24.02: 50sqmm small copper jumpers

The price shall cover supply of Small jumper wire size 50sqmm as per RDSO specification, and on a flat rate basis, the supply of all components and fittings required for providing a flexible small copper jumper connection, including supply of parallel clamps, bi-metallic and Aluminium Copper Al-Cu strips, wherever required, and bolted type terminal connector where ever required.

The price shall also cover the erection of the complete jumper assembly including jumper wire. The price shall not, however, be applicable for jumper connections already including under other items.

24.03: Aluminium feeder jumper

The price shall cover on a flat rate basis the supply and erection of an aluminium jumper complete with all components and fittings required for providing jumper connection, including parallel clamps, bimetallic ALCU strips wherever required, and terminal or tee clamps at either end. The price shall be applicable for any aluminium jumper/connections in any combination between feeders, return conductors, isolators and outgoing bus bars or switching stations. Jumper connections for 25 KV feeders at angle tower traction sub-station or at feeding stations will also be paid under this item.

24.04: Large copper jumper 160 Sq. mm with accessories

This jumper shall be provided between 36 mm Aluminium bus and the copper cross feeder at SP/SSP/FP locations. The price shall cover the supply of 160sqmm flexible copper jumper wire, made of annealed stranded 100% pure copper conductor as per RDSO's specification including all components and fittings required for providing a flexible copper jumper (160 Sq. mm) and connection between 36 mm Aluminium bus and cross feeder including Terminal connector, parallel clamps, Al-Cu bimetallic strips, fasteners. The price shall also cover the erection of the complete jumper assembly including jumper wire.

Item No. 25: Supply, Erection, Testing and Commissioning of 110 V, 200 Ah Low Maintenance Lead Acid Batteries

The price shall cover supply and erection of a 110V, 200Ah low maintenance lead acid battery complete with stand and all the required accessories as mentioned in relevant specification and a tool board. The price for erection shall include installation, connecting up, charging and commissioning of 110 V Low Maintenance Lead Acid Batteries. 110V Low Maintenance Lead Acid Batteries shall conform to latest RDSO specification.

Item No. 26: Erection, testing and commissioning of Battery Chargers for 110V, 200 Ah Low Maintenance Lead Acid Batteries

The price shall cover erection, connecting up and commissioning of battery charger for charging 110V, 200Ah Low Maintenance Lead Acid battery. The price for erection shall include grouting of the charger in position or mounting it on the wall, supply of base frames (if applicable) along with required accessories (Nuts, Bolts, Washers, etc.) and connecting it to 240 V A.C. L.T. Distribution Boards through cable.

Item No. 27: Supply, Erection, Testing and Commissioning of 240 V A.C. L.T. Distribution Boards in the Control Room for 25 KVA L.T. Supply Transformer

The price shall cover supply and erection of a 240V AC distribution board in the Control Room. It shall include the grouting of the framework of the distribution board in position or mounting it on the wall and necessary connections. 240V A.C. L.T. Distribution Boards in the Control Room for 25 KVA L.T. Supply Transformer shall conform to RDSO specification.

Item No. 28: Supply, Erection, Testing and Commissioning of 110 V D.C. Distribution Boards

The price shall cover supply and erection of an 110V DC distribution board in the control room. The price shall include the grouting of the frame work of the distribution board in position or mounting it on the wall and necessary connections. 110V D.C. Distribution Board shall conform to RDSO specification.

Item No. 29: Supply, Laying, Termination and Testing of cables for:

29.01: Circuit Breakers and Interrupter Control & Indication Circuit (7Cx2.5sqmm Copper)

The price shall cover supply and installation per meter length of a PVC 1100V grade 2.5 sq.mm (copper conductor) 7 core cable from each circuit breaker and Interrupter to the Control and Relay Board.

29.02: Transformer Alarm/Trip Circuits and Tap Changer Control (10Cx2.5sqmm Copper)

The price shall cover supply and installation per meter length of a PVC 1100V grade 2.5 sq.mm. (Copper conductor) 10 core cable from the Marshalling of each 132/25KV Traction Transformer to the Control and Relay Board.

29.03: Transformer Bushing C.T. Circuits and 110V DC circuits (4Cx4sqmm Copper)

The price shall cover supply and installation per meter length of PVC 1100V grade 4 sq.mm (copper conductor) 4 core cable from each 132/25kV transformer to the Control and Relay Board and from Battery charger to Battery and Battery Charger to DC distribution board.

29.04: Current Transformer Circuits, 110 Volts. DC and 240V AC Supply Circuits (2Cx4sqmm Copper)

The price shall cover supply and installation per meter length of PVC 1100V grade 4 sq.mm (copper conductor) 2 Core cable from each current transformer to the control and relay board, from 110V DC distribution board to the control and Relay Board and from 240V A.C. LT distribution board to Battery Chargers.

29.05: Potential Transformer Circuits, 240V AC Supply Circuits (2Cx2.5sqmm Copper)

The price shall cover supply and installation per meter length of PVC 1100V grade 2.5 sq.mm (copper conductor) 2 Core cable from each potential transformer to the control and Relay Board, and from 240V AC LT distribution board to control and relay board.

29.06: 240V Heater Circuits (2Cx4sqmm Aluminium)

The price shall cover supply and installation per meter length of 1100V Grade PVC insulated heavy duty 2 Core 4 sq.mm aluminium conductor cable for space heater provided in control cabinets of various equipments and control panel.

29.07: L.T. Power supply to control room and Oil filtration plant (2Cx150sqmm Aluminium)

The price shall cover supply and installation per meter length of an 1100V grade 150 sq.mm aluminium conductor 2 Core PVC insulated and armoured cable from each L.T. supply transformer to the L.T. A.C. distribution boards and from there to 132/25KV Traction Transformer for extending L.T. supply to blower fans and oil filtration plants.

Note for Item 29:

i. The price for erection of cables shall include cable boxes, metallic glands, identification labels, terminal connectors, copper lugs and laying in ducts or pipes as required.
ii. The price for erection shall include connecting up of the cable at either end. It shall also include clamping of the cable on steel supports fixed in the trenches, on the structures, on the frame work of the equipment or on the wall of the Control Room as required.
iii. For purposes of payment, fraction of a meter in total length of cable of each type used in a sub- station shall be rounded off to the nearest meter (0.5m or below being ignored).

Item No. 30: Supply, Erection, Testing and Commissioning of Earthing System

30.01: Earth electrode as per RDSO Standards.

The price shall cover supply and erection of an earth electrode as per RDSO drawing. The price shall cover the provision of a protective concrete box with removable cover as shown in the drawing. The price shall include the testing of earth value and painting the particulars on the box.

Note for Item 30.01:

The price shall be inclusive of concrete box with cover for this item.

30.02: Earth leads 75x8mm mild Steel laid in the ground

The price shall cover supply and installation per meter length of 75x8mm mild steel flat, buried at a depth of 60cm below ground level. The price shall also cover connections of the steel flats to the earth electrodes to constitute the main earth ring and to the earthed terminals of the 132/25kV transformers etc. as required.

30.03: Earth leads 50x6 mm mild steel laid in the ground

The price shall cover supply and installation per meter length of 50x6mm mild steel flat buried at a depth of 60cm below ground level. The price shall also cover connections of the steel flats to the main earth ring and to the steel structures and metallic frame work/terminals of various equipments, as required.

30.04: Earth leads 75x8 mm mild steel flat laid exposed

The price shall cover supply and installation per meter length of 75x8 mm mild steel flat, painted all around with two coats of painting to colour grass green shade-218 of IS: 5 passing through cable trench or exposed above ground level. The price shall also cover the connections of the steel flats to the earth electrodes, to constitute the main earth ring and to the earthed terminals of the various equipments as required.

30.05: Earth leads 50x6 mm mild steel flat laid exposed

The price shall cover supply and installations per meter length of 50x6 mm mild steel flat painted all around with two coats of painting to colour grass green shade-218 of IS:5 passing through cable trench or exposed above ground level. The price shall also cover the connections of the steel flats to the main

earth ring and to the steel structures and metallic frame work/terminals of various outdoor equipments as required.

30.06: 8 SWG G.I. Wire for Earthing

The price shall cover supply, shaping and erection of 8 SWG G.I wire per meter used for earthing of control panels, L.T. AC and DC distribution boards, battery chargers, etc. at sub-station control rooms. The requirement of fencing panel earthing to the nearest fencing upright shall also be included and paid for under this item.

30.07: 32mm dia MS Rod for earth mat

The price shall cover supply and installation per meter length of bare mild steel rod of dia 32mm to be buried at a depth of 60cm. below the ground level to form the earthing grid & connected to earth electrodes. The price shall also cover jointing of the M.S. rods to form earthing grid and connection to M.S. flats for system earthing.

30.08: Copper Strip 25x3mm for Equipment Earthing

The price shall cover supply and erection of 25mmx3mm copper strips to connect the earth terminals of equipments like L.T. supply transformers to the main masts on which they are mounted. The price shall cover all fastenings required for fixing the copper strips along any structure member.

30.09: Earth Screen Wire

The price shall cover supply and stringing per meter length of 25 tone quality 19/2.5mm (70Kg/mm) galvanised steel stranded wire. It shall include the supply and erection of suitable terminations using strain clamps adjuster (on one side only) etc. It shall also include connecting by means of suitable terminal spades, the end of the earth screen wire to the main members of the columns of portals gantries across which these wires are strung or to 50x6mm M.S. flat earth leads. For purposes of payment the clear span between the structures on which earth wire is run shall be adopted. The clear span will be rounded off to the nearest meter (0.5m and below being ignored).

Item No. 31: Supply, Erection, Testing and Commissioning of Fencing:

31.01: Fencing panels at sub-stations

The prices shall include supply and erection of fencing panels painted with two coats of red oxide zinc chromate primer as per RDSO/Railway Standards and finished with two coats of aluminium paint to IS:2339. The prices shall not include supply and erection of fencing uprights, anti-climbing devices but shall include the cost of fasteners and the price shall be for a meter length of the panels, measured in the plan view of the approved drawings.

31.02: Fencing uprights

The price shall cover supply and erection of fabricated fencing uprights painted with two coats of red oxide zinc chromate primer as per RDSO/Railway Standards and finished with two coats of Aluminium paint to IS: 2339. The price shall be on the basis of black weight of the steel section of the approved drawing with no deduction for holes and skew cuts or no increase for weld materials. The cost of

foundation of uprights will be paid under item 2. Provision of the earth connections connecting each upright with the main earth bus as per approved drawing shall be paid under item 24.

Note for Item 31.02:
All fasteners, bolts, nuts, locknuts and washers etc. required for assembly and fixing of steel work shall be galvanized.

31.03: Anti-climbing device at Sub-stations

The price shall cover supply and erection of an anti-climbing device consisting of steel fixtures and galvanized barbed wire mounted on the fencing panels as per approved drawings. The price shall be per meter length of the panel. The price shall include painting of the fixtures with two coats of red oxide zinc chromate primer and two finishing coats of aluminium paint as per RDSO/Railway Standards & IS: 2339.

Note for Item 31:
The prices shall also include supply of all necessary galvanized steel bolts, nuts, lock-nuts and washers etc. required for assembly and fixing of the steel work.

Item No. 32: Erection, testing & commissioning of 132/27KV, 21.6/30.24 MVA single phase Power Transformer

The traction power transformer complete with all accessories including oil (which may be in separate drums/containers) will be handed over by the Purchaser at the location specified elsewhere in this contract. The Contractor shall bring the transformer on to its correct position on the foundation and erect all the accessories, check-up the alignment and make connections of HV and LV terminals to the 132kV and 25kV bus-bars. All necessary terminal connectors on HV and LV Side as per RDSO drawings shall be supplied by the contractor. The Contractor shall carry out oil filtration and pre-commissioning tests as approved by the Purchaser and commission the transformers strictly in accordance with the instructions of the transformer manufacturer or his commissioning Engineer at site to the complete satisfaction of the Purchaser. The Contractor shall be held responsible to ensure that the work is carried out to the highest standards, in accordance with the relevant codes of practice and any special conditions/guidelines/requirements as laid down by the manufacturer of the transformer are properly complied with contractor shall notify the manufacturer regarding likely date of commissioning, one month in advance, so that the manufacturer can depute his representative if so desired by him at his own cost, for warranty obligation purposes. Notwithstanding availability of manufacturer's representative or otherwise, it shall be contractor's responsibility to ensure that the equipment is commissioned as per laid down procedure. However, in case of any extra cost being incurred in this regard, due to delay on the part of the Contractor the same shall be recovered the Contractor. The Contractor shall make his own arrangements for oil filtration equipment as well as power supply required for the same. All necessary tools, equipment, instruments required for carrying out necessary checks and tests and commissioning of the transformer shall be arranged by the Contractor with Calibration certificates.

Item No. 33: Supply, Erection, Testing and Commissioning of 25 kV Shunt Capacitor bank

The lump sum price shall cover supply, erection testing and commissioning of 5500KVAR at 40KV (2469 KVAR at 25kV) shunt capacitor bank at Traction sub-stations, complete with capacitor unit, internal fuses, discharge devices, rack insulator assembly, inter-connector between units, insulators, suitable earthing lugs including terminal connectors and other material and hardware required for satisfactory operation of the unit.

It shall also include mounting of the capacitor bank on the supporting structures and its connecting up to other equipments. Payment for supporting structure shall be made under item 2.

The contractor shall carryout pre-commissioning tests as approved by the purchaser and commission the shunt capacitor bank strictly in accordance with the instructions of the shunt capacitor bank manufacturer or his commissioning engineer at site to the complete satisfaction of the purchaser. The contractor shall be held responsible to ensure that the work is carried out to the highest standards, in accordance with relevant codes of practice and any special conditions/ guidelines/requirements as laid down by the manufacturer of the shunt capacitor bank are properly complied with. The contractor shall notify the manufacturer regarding likely date of commissioning, one month in advance so that the manufacturer can depute his representative, if so desired by him, at his own cost, for warranty obligation purposes. Notwithstanding availability of manufacturer's representative or otherwise, it shall be contractor's responsibility to ensure that the equipment is commissioned as per laid down procedure. All necessary tools, equipments, instruments required for carrying out necessary checks and commissioning of the shunt capacitor bank shall be arranged by the contractor. 25kV Shunt Capacitor bank shall conform to RDSO specification.

Item No. 34: Supply, Erection, Testing and Commissioning of Low Loss Series Reactor suitable for Shunt capacitor bank

The prices shall cover supply, erection and connecting up of series reactor suitable for 5500 KVAR at 40 KV (2469 KVRA at 25kV) shunt capacitor bank complete with all fittings and accessories including connectors. It shall include mounting of the series reactor in position. 25kV Shunt Capacitor bank equipment shall conform to RDSO specification.

Item No. 35: Supply, Erection, Testing and Commissioning of 25 kV Current transformers (200-100/5A)

The prices shall cover supply, erection and connecting up of a 25kV Current transformer with ratio 200-100/5A complete with all fittings and accessories including terminal connectors. Current transformer shall conform to RDSO specification. The price shall include mounting of the current transformer in position.

Item No. 36: Supply, Erection, Testing and Commissioning of 25 kV Neutral Current Transformer

The prices shall cover supply, erection of 25KV neutral current transformer for protection of the capacitor bank. The price shall also cover connecting of the neutral current transformer with capacitor bank and control and relay panel. It shall also cover mounting of the neutral current transformer on the supporting frame.

Item No. 37: Supply, Fabrication and Erection of Steel Chequered Plate for trench covers inside control room

The price shall cover supply, fabrication and erection of steel chequered plate for trench covers inside control room. Chequered Plates shall be supplied as per IS-3502.

Item No. 38: Supply and Laying of Insulating Rubber Mat (1x5m, 3mm thick)

The Price shall cover supply and laying of Insulating Rubber Mat required for control rooms of Traction Sub-Station. Insulating Rubber Mat shall conform to IS-15652 and shall have BIS mark embossed on it.

Item No. 39: Supply and Fixing of Fire Fighting System:

39.01: Fire extinguisher (CO_2 type – cap 9 Kg), with Trolley mounting

The Price shall cover supply and fixing of CO2 type Fire Extinguisher of 9Kg with trolley mounting. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

39.02: Fire extinguisher (DCP type – cap 6 Kg), with suitable wall mounting inside TSS building.
The Price shall cover supply and fixing of DCP type Fire Extinguisher of 6Kg with suitable wall mounting. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

39.03: Fire buckets stand with 04 Nos. fire buckets filled with sand, with suitable stand / locking arrangement & MS sheet canopy as per drawing approved by Railway.
The Price shall cover supply and installation of Fire buckets stand with 04 Nos. fire buckets filled with sand, with suitable stand / locking arrangement & MS sheet canopy as per drawing approved by Railway. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

Item No. 40: Supply & Installation of First Aid Box complete with medicines.
The price shall cover Supply and erection of First Aid box 10mm thick Teakwood/Standard Plywood with sun mica on top and inside, size 50cm x 30cm x 20cm with locking arrangement and fixing inside TSS.

Item No. 41: Supply, Erection, Testing and Commissioning of Various Boards:

41.01: Caution Board/Danger boards

The price shall cover supply and erection, wherever required, of enamelled caution board/Danger Board including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

41.02: 25 kV Shock Treatment Charts & Do and Don't Charts (Framed Flax Print Type) with aluminium bit, Size (2 feet x 3 feet)

The price shall cover supply and erection of 25 kV Shock Treatment Charts & Do and Don't Charts (Framed Flax Print Type) with aluminium bit, Size (2 feet x 3 feet) including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

41.03: Number Plates on Structures

The price shall cover supply, erection, testing and commissioning of enamelled number plates on structures along with all necessary fixing accessories. The number plates shall be of approved make and as per RDSO specification.

41.04: Number Plates on Equipment

The price shall cover supply, erection, testing and commissioning of enamelled number plates on equipment along with all necessary fixing accessories. The number plates shall be of approved make and as per RDSO specification.

41.05: Sectioning Diagram board for operating control (3x6feet)

The price shall cover supply and erection of Sectioning diagram of suitable size duly framed & dimensions as per the instructions of Railway supervisor.

41.06: Name Plate for Traction Sub-station

The price shall cover supply and erection of Name Plate for Traction Sub-Station including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

41.07: Name Board (M.S. Sheet painted with M.S. frame) on fencing panel

The price shall cover supply, erection of Name board for fencing panel (M.S. Sheet painted along with M.S. frame) including mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

41.08: First Aid Staff and nearest doctor name board (300mmx500mm)

The price shall cover supply and erection of Name board of first aid staff and nearest doctor for Traction Sub-Station including mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

41.09: Nearest Fire Fighting authority name and address board (250mmx500mm)

The price shall cover supply and erection of Name board of nearest fire fighting authority name and address for Traction Sub-Station including mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

Item No. 42: Supply, Erection, Testing and Commissioning of Buried Rail 13m long 2nd class 52KG

The price shall cover a steel rail of section 52 Kg/m and length about 13 m which shall be buried near the track at the traction substation at a depth of about 1 m to form part of the earthing system. Two separate and distinct connections shall be made by means of 75 mm x 8 mm MS flats between the earthing grid and the buried rail. The buried rail shall also be connected by means of two separate and distinct connections made with 75 mm x 8 mm MS flats to the non-track circuited rail in a single rail track – circuited section and to the neutral point(s) of impedance bond(s) in a double- rail track circuited section. In case where the feeding post is located separately away from the traction substation, the buried rail shall be provided at the feeding post (where one terminal of the secondary winding of the traction power transformer is grounded).

Item No. 43: Supply and Installation of Furniture:

43.01: Office furniture-Steel crane chairs of Godrej/Venus/other reputed make

43.02: Office furniture-Writing Table with 3 drawers one side and shelf on other side of Godrej/Venus/other reputed make

43.03: Office furniture-Cupboard steel with 4 shelves of Godrej/Venus/other reputed make

43.04: Office furniture-Workman GI Steel Table 4ft height with bench wise

43.05: Office furniture-Wooden Key Box with glass front in frame, with hinges and locking arrangements 18x24x6inches

Notes for item 43:

The Items procured/Fabricated shall be got inspected by the representative of the purchaser before it is installed/provided at locations. Materials/Raw materials required for various items shall be as follows:

a. For wooden items Seasoned Teak Wood shall be used.
b. Rubber gloves shall be shall be ISI marked (IS-4770/1991)
c. Brass Padlocks shall be of Harrison or Godrej (Navtal) make
d. Rail Jumpers to be procured from CORE/RDSO approved source.

5.3 SP/SSP Particulars (Excluding Civil and Illumination Works)

Item No. 1: Deleted

Item No. 2 Supply, Erection, Testing and Commissioning of Steel Structures:

2.01: Rolled traction masts galvanized steel structures

The price shall cover cost of supply and erection, at respective site / locations, as per RDSO drawing of individual RSJ Mast, rolled traction masts, B-series mast, Dwarf masts and other type of masts. For the purpose of payment, the weights of individual traction mast shall be determined for each type on the basis of the payable weights per meter length and per meter weights given in tables of Railways [as per respective RDSO drawing for standard types]. For special types, the payable weight per meter length will be decided by the Purchaser, at the time of approval of designs. The galvanization should be as per respective RDSO drawing/standard.

2.02: Fabricated & galvanized steel structures

The price shall cover cost of supply and erection, at respective site / locations, as per RDSO drawing of individual fabricated & galvanized steel structures. For the purpose of payment, the weights of individual traction mast shall be determined for each type on the basis of the payable weights per meter length and per meter weights given in tables of Railways [as per respective RDSO drawing for standard types]. For special types, the payable weight per meter length will be decided by the Purchaser, at the time of approval of designs. The galvanization should be as per respective RDSO drawing/standard.

Fabricated & galvanized steel work other than masts including SPS

The price shall cover the cost of supply and erection of all galvanized fabricated steel work including fasteners other than items in 2.01 and 2.02 which are required to be supplied by the Contractor. For standard fabricated steel work for which RDSO's drawings are available, the weight of steel work as specified in RDSO's drawing shall be considered for payment. However, in case the unit sectional weight of any member indicated in RDSO's drawing is not in conformity with the unit sectional weight as per the latest IS specification, the weight of the fabricated steel work shall be calculated on the basis of latest IS Specification and the same will be considered for payment. For the non-standard fabricated steel work, the calculated weight to be considered for payment under this item shall be included in the relevant drawing based on latest IS sectional weight at the time of submitting the designs for approval of the Purchaser. The galvanization should be as per respective RDSO drawing/standard. The price shall cover painting with primer and finish paint as required.

Notes for Items No. 2:

i. The price shall cover cost of erection, alignment, setting before grouting, wherever required, tower/steel tower/steel work for feeders for TSS/SP/SSP, drop arms, MS Angles, Channels, standard super mast, stub masts for anchoring, complete with anchor plates drilled and welded in position, multiple cantilever cross

arm, chairs, adopters for bracket assemblies and all other small part steel works, the erection of which shall also carried out by the contractor. The price shall also include supply and erection of galvanized bolts, nuts washers etc. wherever required as per approved design and drawings. The price shall also include the cost of repairing of platform shelters in case the shelter is dismantled/damaged during the course of erection of a mast/portal at platforms.

ii. There will be no addition for increased weight due to galvanizing or painting or weld material or reduction for holes or skew cuts. The price shall cover shifting / transportation of each masts up to individual locations.

iii. Unless specifically indicated none of the other items of work shall include the cost of supply and / or erection of small part steel work, which will invariably be paid for under item 2.03 as applicable respectively.

iv. All Galvanized / SS bolts, nuts, lock nuts and washers required for assembly and fastening of steel work mentioned against item No. 2.02 and mounting of the above equipments in gantries shall be supplied by the Contractor.

v. The price shall also include the straightening of masts/portal uprights bent during transit and cutting of masts/portal uprights to suit the site conditions. The payment shall be made on the basis of final lengths/weights of the masts/structures in case the same are cut/modified as indicated above before erection. In case cutting of mast or worn out galvanization, application of cold galvanization paint at the site shall be done by the contractor immediately.

Item No. 3: Erection, Testing and Commissioning of 25KV Vacuum Interrupters

The price shall cover erection of 25 KV Vacuum Interrupters complete with operating mechanism, all fittings and accessories including terminal connectors. The price shall cover grouting the supporting frame and mechanism box on foundation block and mounting of other accessories in their respective places. It shall also cover testing and commissioning of the Interrupters. The Contractor shall make his own arrangement for power supply required for testing purpose. All necessary tools, equipments and instruments required for carrying out necessary checks, tests and commissioning shall be arranged by the Contractor.

Item No. 4: Supply, Erection, Testing and Commissioning of 25KV Potential Transformers (Type-I)

The price shall cover supply & erection of a 25KV potential transformer type-I complete with all fittings and accessories as per relevant specification including terminal connectors and fixing bolts. The price for supply and erection shall include proper alignment of the transformer in position. The price shall not include the cost of any small parts steel work. 25KV Potential Transformers (Type-I) shall conform to RDSO specification.

Item No. 5: Supply, Erection, Testing and Commissioning of 42 KV Lightning Arrestors

The price shall cover supply & erection of a 42KV Lightning Arrestor complete with all fittings and accessories including terminal connector. It shall also include mounting and connecting up of the Lightning Arrestor in position. 25KV Lightning Arrestors shall conform to RDSO specification.

Item No. 6: Supply, Erection, Testing and Commissioning of 25KV isolators

6.01: 25kV Single Pole Isolators (1600A)

The price shall cover the supply and erection, alignment and connecting up 25kV Single Pole Isolator complete with mounting base, operating rod, operating mechanism, necessary interlock mechanism and

all accessories required for its smooth and trouble free operation. The price including solid core Post Insulator etc. shall also cover supply a pad lock for each Isolator. Bus bar connector provided for making connection to Isolator terminal pad shall be paid under item 10. 25kV Single Pole Isolators (1600A) shall conform to RDSO specification.

6.02: 25 kV Double Pole Isolators (1600A)

Same as for item 6.01 above except that the price shall cover supply and erection of double pole Isolator instead of single pole Isolator.

Item No. 7: Erection, Testing and Commissioning of 25 KV/240 V Auxiliary Supply Transformer (10 kVA capacity) Oil type along with hardware

The price shall cover erection, testing and commissioning of 25 KVA L.T. Supply transformer complete with all fittings and accessories including terminal connectors. The price shall include supply and erection of 5 SWG copper jumper wire required for connecting and also include mounting of the transformer on its supporting structure. The price shall also cover oil filtration, testing and commissioning of the transformer. The Contractor shall make his own arrangement for oil filtration plant as well as power supply for the same.

Item No. 8: Supply, Erection, Testing and Commissioning of 25 KV Drop out fuse switches for 10 KVA Auxiliary Supply Transformer

The price shall cover supply & erection, and connecting up of 25KV drop out fuse switches for 10 KVA capacity Auxiliary Supply Transformers complete with all mounting accessories including terminal connectors. It shall also include the erection of insulators, operating pole and fuse links. 25KV Drop out fuse switches for 10 KVA Auxiliary Supply Transformer shall conform to RDSO specification.

Item No. 9: Supply, Erection, Testing and Commissioning of Aluminium bus-bar of 36 mm x 28 mm

The price shall cover supply and erection of Aluminium bus-bars 36mm x 28 mm including bending, shaping and clamping on to insulators, connectors or equipment terminals.

Note for item 9:

The price under item 9 does not cover the cost of terminal connectors which will be paid for under item 10.

Item No. 10: Supply, Erection, Testing and Commissioning of Terminals and connectors

The price shall cover supply and erection of a bus-bar junction, terminals and connector of the type specified, including bolts, nuts, lock nuts, washers etc. required at the junction of bus-bars. The price shall also include supply and erection of `ALCU' strip if required to be provided at the junction.

Item No. 11: Supply, Erection, Testing and Commissioning of 25 kV Support Insulators with hardware

The price shall cover the supply and erection of a 25kV solid core post insulator to support Aluminium bus-bars. It shall include supply of fixing bolts, nuts, locknuts, washers and studs etc. It shall also cover-erection of all components required for the assembly including post insulator. Bus-bar clamps/jumper clamps for clamping the bus-bars/jumpers shall be paid under item 10.

Item No. 12: Supply, Erection, testing and commissioning of 110 V, 40 Ah Low Maintenance Lead Acid Batteries

The price shall cover supply and erection of a 110V, 40Ah low maintenance lead acid battery complete with stand and all the required accessories as mentioned in relevant specification and a tool board. The price for erection shall include installation, connecting up, charging and commissioning of 110 V Low Maintenance Lead Acid Batteries. 110V Low Maintenance Lead Acid Batteries shall conform to latest RDSO specification.

Item No. 13: Erection, testing and commissioning of Battery Chargers for 110V, 40 Ah Low Maintenance Lead Acid Batteries

The price shall cover erection, connecting up and commissioning of Battery charger for charging 110V, 40Ah Low Maintenance Lead Acid battery. The price for erection shall include grouting of the charger in position or mounting it on the wall, supply of base frames (if applicable) along with required accessories (Nuts, Bolts, Washers, etc.) And connecting it to 240 V A.C. Fuse Box through cable.

Item No. 14: Supply, Erection, Testing and Commissioning of terminal boards in control cubicles.

The price shall cover supply and erection of a wall mounted terminal board with six numbers of two way terminal blocks for connecting the cables from the outdoor equipment of a switching station as per Railway Drawing.

Item No. 15: Supply, Erection, Testing and Commissioning of an iron clad 110 V D.C. fuse box

The price shall cover supply and erection of a 15A, 110V iron clad two way fuse box on the wall inside the remote control cubicles. The fuse box shall be complete with two fuse carriers and bases.

Item No. 16: Supply, Erection, Testing and Commissioning of iron clad 230 V A.C. fuse box for 10KVA LT Supply Transformer

The price shall cover supply and erection of a 15A, 230V, A.C. iron clad 4-way fuse box on the wall inside the remote control cubicle, for heater supply of interrupters. The fuse box shall contain four fuse carriers and bases.

Item No. 17: Supply, Laying, Termination and Testing of cables for:

17.01: Circuit Breakers and Interrupter Control & Indication Circuit (7Cx2.5sqmm Copper)

The price shall cover supply and installation per meter length of a PVC 1100V grade 2.5 sq.mm (copper conductor) 7 core cable from each circuit breaker and Interrupter to the Control and Relay Board.

17.02: 240V Heater Circuits (2Cx4sqmm Aluminium)

The price shall cover supply and installation per meter length of 1100V Grade PVC insulated heavy duty 2 Core 4 sq.mm aluminium conductor cable for space heater provided in control cabinets of various equipments and control panel.

17.03: Catenary Indication, 110V AC Supply Circuits (2Cx2.5sqmm Copper)

The price shall cover supply and installation per meter length of PVC 1100V grade 2.5 sq.mm (copper conductor) 2 Core cable from each P.T. line indication type to terminal board.

17.04: L.T. Power Supply to control cubicle (2Cx70sqmm Aluminium)

The price shall cover supply and installation per meter length of PVC insulated and armoured 70 sq.mm 2Core Aluminium conductor cable from 25 kVA L.T. Supply Transformer to L.T. distribution board.

17.05: 110 Volts. DC and 240V AC Supply Circuits (2Cx4sqmm Copper)

The price shall cover supply and installation per meter length of PVC 1100V grade 4 sq.mm (copper conductor) 2 Core cable from each current transformer to the control and relay board, from 110V DC distribution board to the control and Relay Board and from 240V A.C. LT distribution board to Battery Chargers.

Note for Item 17:

i. The price for erection of cables shall include cable boxes, metallic glands, identification labels, terminal connectors, copper lugs and laying in ducts or pipes as required.
ii. The price for erection shall include connecting up of the cable at either end. It shall also include clamping of the cable on steel supports fixed in the trenches, on the structures, on the frame work of the equipment or on the wall of the Control Room as required.
iii. For purposes of payment, fraction of a meter in total length of cable of each type used in a sub- station shall be rounded off to the nearest meter (0.5m or below being ignored).

Item No. 18: Supply, Erection, Testing and Commissioning of Earthing System

18.01: Earth electrode as per RDSO Standards.

The price shall cover supply and erection of an earth electrode as per RDSO drawing. The price shall cover the provision of a protective concrete box with removable cover as shown in the drawing. The price shall include the testing of earth value and painting the particulars on the box.

Note for Item 18.01:

The price shall be inclusive of concrete box with cover for this item.

18.02: Earth leads 75x8mm mild Steel laid in the ground

The price shall cover supply and installation per meter length of 75x8mm mild steel flat, buried at a depth of 60cm below ground level. The price shall also cover connections of the steel flats to the earth electrodes to constitute the main earth ring and to the earthed terminals of the 132/25kV transformers etc. as required.

18.03: Earth leads 50x6 mm mild steel laid in the ground

The price shall cover supply and installation per meter length of 50x6mm mild steel flat buried at a depth of 60cm below ground level. The price shall also cover connections of the steel flats to the main earth ring and to the steel structures and metallic frame work/terminals of various equipments, as required.

18.04: Earth leads 75x8 mm mild steel flat laid exposed

The price shall cover supply and installation per meter length of 75x8 mm mild steel flat, painted all around with two coats of painting to colour grass green shade-218 of IS: 5 passing through cable trench or exposed above ground level. The price shall also cover the connections of the steel flats to the earth electrodes, to constitute the main earth ring and to the earthed terminals of the various equipments as required.

18.05: Earth leads 50x6 mm mild steel flat laid exposed

The price shall cover supply and installations per meter length of 50x6 mm mild steel flat painted all around with two coats of painting to colour grass green shade-218 of IS:5 passing through cable trench

or exposed above ground level. The price shall also cover the connections of the steel flats to the main earth ring and to the steel structures and metallic frame work/terminals of various outdoor equipments as required.

18.06: Structure bond 50x6 mm

The price shall cover supply of all materials including mild steel flat required to provide a structure bond connecting a traction mast or structures to the nearest non-track circuited rail, or earth electrode, including all fastenings at both ends. The price shall include shaping and drilling of the bond and erection of all materials including the bond. The price shall also include provision of heat shrinkable PVC tube for structure bond under track-circuited rail. This would also cover connections or earthing terminals of equipments like L.T. transformers with structures and then to Rails as per relevant drawing. The cost is also includes the painting with black enamel colour to bonds.

18.07: Copper Strip 25x3mm for Equipment Earthing

The price shall cover supply and erection of 25mmx3mm copper strips to connect the earth terminals of equipments like L.T. supply transformers to the main masts on which they are mounted. The price shall cover all fastenings required for fixing the copper strips along any structure member.

Item No. 19: Supply, Erection, Testing and Commissioning of Buried Rail 13m long 2nd class 52KG

The price shall cover a steel rail of section 52 Kg/m and length about 13 m which shall be buried near the track at the substation at a depth of about 1 m to form part of the earthing system. Two separate and distinct connections shall be made by means of 75 mm x 8 mm MS flats between the earthing grid and the buried rail. The buried rail shall also be connected by means of two separate and distinct connections made with 75 mm x 8 mm MS flats to the non-track circuited rail in a single rail track – circuited section and to the neutral point(s) of impedance bond(s) in a double- rail track circuited section.

Item No. 20: Supply, Erection, Testing and Commissioning of Fencing:

20.01: Fencing panels at sub-stations

The prices shall include supply and erection of fencing panels painted with two coats of red oxide zinc chromate primer as per RDSO/Railway Standards and finished with two coats of aluminium paint to IS:2339. The prices shall not include supply and erection of fencing uprights, anti-climbing devices but shall include the cost of fasteners and the price shall be for a meter length of the panels, measured in the plan view of the approved drawings.

20.02: Fencing uprights

The price shall cover supply and erection of fabricated fencing uprights painted with two coats of red oxide zinc chromate primer as per RDSO/Railway Standards and finished with two coats of Aluminium paint to IS: 2339. The price shall be on the basis of black weight of the steel section of the approved drawing with no deduction for holes and skew cuts or no increase for weld materials. The cost of foundation of uprights will be paid under item 2. Provision of the earth connections connecting each upright with the main earth bus as per approved drawing shall be paid under item 24.

Note for Item 31.02:

All fasteners, bolts, nuts, locknuts and washers etc. required for assembly and fixing of steel work shall be galvanized.

20.03: Anti-climbing device at Sub-stations

The price shall cover supply and erection of an anti-climbing device consisting of steel fixtures and galvanized barbed wire mounted on the fencing panels as per approved drawings. The price shall be per meter length of the panel. The price shall include painting of the fixtures with two coats of red oxide zinc chromate primer and two finishing coats of aluminium paint as per RDSO/Railway Standards & IS: 2339.

Note for Item 20:

The prices shall also include supply of all necessary galvanized steel bolts, nuts, lock-nuts and washers etc. required for assembly and fixing of the steel work.

Item No. 21: Supply, Erection, Testing and Commissioning of Various Boards:

21.01: Caution Board/Danger boards

The price shall cover supply and erection, wherever required, of enamelled caution board/Danger Board including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

21.02: 25 kV Shock Treatment Charts & Do and Don't Charts (Framed Flax Print Type) with aluminium bit, Size (2 feet x 3 feet)

The price shall cover supply and erection of 25 kV Shock Treatment Charts & Do and Don't Charts (Framed Flax Print Type) with aluminium bit, Size (2 feet x 3 feet) including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

21.03: Number Plates on Structures

The price shall cover supply, erection, testing and commissioning of enamelled number plates on structures along with all necessary fixing accessories. The number plates shall be of approved make and as per RDSO specification.

21.04: Number Plates on Equipment

The price shall cover supply, erection, testing and commissioning of enamelled number plates on equipment along with all necessary fixing accessories. The number plates shall be of approved make and as per RDSO specification.

21.05: Name Plate for Switching Stations (SP/SSP)

The price shall cover supply and erection of Name Plate for Switching Stations including GI mounting clamps, as per relevant RDSO drawings and specifications with nut and bolts etc.

Item No. 22: Supply & Installation of First Aid Box complete with medicines.

The price shall cover Supply and erection of First Aid box 10mm thick Teakwood/Standard Plywood with sun mica on top and inside, size 50cm x 30cm x 20cm with locking arrangement and fixing inside SP/SSP.

Item No. 23: Supply and Fixing of Fire Fighting System:

23.01: Fire extinguisher (CO2 type – cap 9 Kg), with Trolley mounting

The Price shall cover supply and fixing of CO2 type Fire Extinguisher of 9Kg with trolley mounting. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

23.02: Fire extinguisher (DCP type – cap 6 Kg), with suitable wall mounting inside TSS building.

The Price shall cover supply and fixing of DCP type Fire Extinguisher of 6Kg with suitable wall mounting. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

23.03: Fire buckets stand with 04 Nos. fire buckets filled with sand, with suitable stand / locking arrangement & MS sheet canopy as per drawing approved by Railway.

The Price shall cover supply and installation of Fire buckets stand with 04 Nos. fire buckets filled with sand, with suitable stand / locking arrangement & MS sheet canopy as per drawing approved by Railway. The Fire Extinguisher shall be supplied as per relevant RDSO/IS standards.

Item No. 24: Supply, Fabrication and Erection of Steel Chequered Plate for trench covers inside control room

The price shall cover supply, fabrication and erection of steel chequered plate for trench covers inside control room. Chequered Plates shall be supplied as per IS-3502.

Item No. 25: Supply and Installation of Office furniture-Wooden Key Box with glass front in frame, with hinges and locking arrangements 18x24x6inches

Notes for item 25:

The Items procured/Fabricated shall be got inspected by the representative of the purchaser before it is installed/provided at locations. Materials/Raw materials required for various items shall be as follows:

a. For wooden items Seasoned Teak Wood shall be used.
b. Brass Padlocks shall be of Harrison or Godrej (Navtal) make

Item No. 26: **Supply, Erection, Testing and Commissioning of Jumpers:**

26.01: 105sqmm large copper jumpers

The price shall cover the supply of Large jumper wire size 105 Sq.mm as per RDSO's specification and on a flat rate basis, the supply of all components and fittings required for providing a flexible copper large jumper connection, including supply of parallel clamps, bi-metallic and Aluminium Copper Al-Cu strips, wherever required, and bolted type terminal connectors where ever required.

The price shall also cover the erection of the complete jumper assembly including jumper wire. The price shall not, however, be applicable for jumper connections already including under other items.

26.02: 50sqmm small copper jumpers

The price shall cover supply of Small jumper wire size 50sqmm as per RDSO specification, and on a flat rate basis, the supply of all components and fittings required for providing a flexible small copper jumper connection, including supply of parallel clamps, bi-metallic and Aluminium Copper Al-Cu strips, wherever required, and bolted type terminal connector where ever required.

The price shall also cover the erection of the complete jumper assembly including jumper wire. The price shall not, however, be applicable for jumper connections already including under other items.

26.03: Aluminium feeder jumper

The price shall cover on a flat rate basis the supply and erection of an aluminium jumper complete with all components and fittings required for providing jumper connection, including parallel clamps, bimetallic ALCU strips wherever required, and terminal or tee clamps at either end. The price shall be applicable for any aluminium jumper/connections in any combination between feeders, return conductors, isolators and outgoing bus bars or switching stations. Jumper connections for 25 KV feeders at angle tower traction sub-station or at feeding stations will also be paid under this item.

5.4 TSS, SP, SSP – Particulars (Illumination Works)

TSS Building, Yard and Approach Road lighting

1. Supply, Erection, testing & commissioning of Point Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable in recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box, 5A Socket and earthing the point with 1.5 sq.mm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable etc. as required. (As per CPWD DSR (E&M)-2018, Item No. 1.10.3)

   Following shall be deemed to be included in point wiring:

   a. Conduit/channel as the case may be, accessories for the same and wiring cables between the switch box and the point outlet, loop protective earthing of each fan/light fixture.
   b. All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.
   c. Metal or PVC switch boxes for control switches, regulators, sockets etc., recessed or surface type, and phenolic laminated sheet covers over the same.
   d. Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
   e. Control switch or MCB, as specified
   f. 3-pin or 6-pin socket, ceiling rose or connector as required. (2-pin and 5-pin socket outlet shall not be permitted.)
   g. Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
   h. Bushed conduit or porcelain tubing where wiring cables pass through wall etc.
   i. Interconnection wiring between switches within the switchbox on same circuit.
   j. There shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.

2. Supply, Erection, testing & commissioning of Point Wiring for light/ power plug with 2x4 sq. mm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable in surface/ recessed medium class PVC conduit along with 1 No. 4 sq. mm. FRLS PVC insulated, flexible, multistranded Cu conductor single core cable for loop earthing as required. (As per CPWD DSR (E&M)-2018, Item No. 1.14.3)

   Following shall be deemed to be included in point wiring:

a. Conduit/channel as the case may be, accessories for the same and wiring cables between the Main Switchboard and the point outlet, looping cable between the Sockets, loop protective earthing of Socket.
b. All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.
c. Outlet boxes, junction boxes, pull-through boxes etc. for loose wires/conduit terminations.
d. Connections to ceiling rose, connector, socket outlet etc.
e. Bushed conduit or porcelain tubing where wiring cables pass through wall etc.
f. The light plug (6A) point and power (16A) point wiring shall be measured on linear basis, from the respective tapping paint of live cable, namely, switch box, another socket outlet point or the sub-distribution board as the case may be up to the socket outlet. The Metal/PVC box and cover, Switch/MCB, Socket outlet Power point outlet shall be supplied separately.

3. Supply, Erection, testing & commissioning of outdoor 1x60W LED Street Light fitting complete. Connection of light from junction box will be done by 2x1.5 Sq.mm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable and 1x1.5Sqmm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable for Earthing in GI Pipe with Clamp. All accessories, hardware as required for E&C shall be included in scope.

4. Supply, Erection testing & commissioning of outdoor 1X150W LED Flood Light. Connection of light from junction box will be done by 2x1.5 Sq.mm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable and 1x1.5Sqmm FRLS PVC insulated, flexible, multi-stranded Cu conductor single core cable for Earthing in GI Pipe with Clamp. All accessories, hardware as required for E&C shall be included in scope.

5. Supply, Erection testing & commissioning of Box Type LED tube light fitting 1x18/20 W Complete with all required mounting hardware etc. All accessories, hardware as required for E&C shall be included in scope.

6. Supply, Erection testing & commissioning of Ceiling Fan (1400mm) complete with D/Rod, canopy and Step type Electronic regulator (Appr. 300-600 W). Regulator shall be fixed on the switchboard next to Fan On-Off switch. Make - Bajaj, Crompton, Khaitan, Orient, Usha, Havells. All accessories, hardware like ceiling hooks etc. as required for E&C shall be included in scope.

7. Supply, Erection testing & commissioning of Exhaust Fan as per IS-2312, Single phase, 380 mm sweep, 1400 RPM complete with mounting arrangement, grills etc. for TSS battery room. All accessories, hardware as required for E&C shall be included in scope.

8. Supply, Erection, testing & commissioning of Air circulators as per IS-2997, Single phase, 30" sweep, 3-Blade type, wall mounted with base plate complete with wire guard, mounting arrangement etc. All accessories, hardware as required for E&C shall be included in scope.

9. Supply, Erection, testing & commissioning of 2x15/5A Power socket 6/3 Pin Piano type complete with LED indicator. Make - Anchor, Reador, Roma.

10. Supply & Erection of Fireproof LED Light Fitting with Lamp 5/8 W complete with suitable holder

11. Supply, Erection, testing & commissioning of Point Wiring for circuit/ sub-main wiring along with earth wire with 2 x 6 sq. mm + 1 x 6 sq. mm earth wire of FRLS PVC insulated, flexible, multistranded Cu conductor, single core cable in recessed medium class PVC conduit as required. (As per CPWD DSR (E&M)-2018, Item No. 1.14.4)

12. Supply, Erection, testing & commissioning of Sheet steel enclosed 20A MCB Controlled 3-Pin 20A Plug socket

13. Supply, Erection, Testing & Commissioning of Sheet steel Distribution board with 1 no. 63A DP incoming Switch and 4 nos. 32A SP, 7 NOs. 16A SP, 2 Nos 6 A SP outgoing MCB with 1+1 Copper Busbars and 2 ON/OFF timers with DP 6A contactors for two Circuits & earth Busbar. Panel shall be suitable for wall cum floor mounting arrangements. Door shall be hinge type with suitable locking arrange ment. Indication Neon lamp shall be provided for each MCB. Panel shall be fabricated using 14 SWG MS sheet and shall be powder coated confirming to relevant IS.

14. Supplying and fixing of 32 mm dia X 2.00 metres long G.I. pipe (medium class) bracket for mounting of fluorescent / HPMV / HPSV street light fitting on pole including bending the pipe to the required shape, 2 nos 40 mm X 3 mm flat iron clamps with nuts, bolts and washer, painting the flat iron with primer and finish paint etc. as required. (As per CPWD DSR (E&M)-2018, Item No. 12.34)

15. Supply & Erection of 11 Mtr Swaged tubelar pole (410SP54 as per IS 2713) with 1.5Mtr Arm. Holes for Junction box, welded bottom plate 350x350x10mm and Stud for earthing should be done before painting & erection. The pole shall be coated with bituminous compound paint internally and externally up to the level which goes inside the earth. Exposed surface shall be coated with one coat of red oxide primer & finished with two coats of aluminium paint. Pole shall be supplied with channel/etc. for mounting of Flood light. All accessories, hardware as required for E&C shall be included in scope.

16. Supply & Erection of 9 Mtr Swaged tubelar pole (410SP32 as per IS 2713) with 1.5 Mtr arm suitable for mounting of street light fixture. Holes for Junction box, welded bottom plate 350x350x10mm and Stud for earthing should be done before painting & erection. The pole shall be coated with bituminous compound paint internally and externally up to the level which goes inside the earth. Exposed surface shall be coated with one coat of red oxide primer & finished with two coats of aluminum paint. All accessories, hardware as required for E&C shall be included in scope.

17. Supply, Erection Testing & commissioning of FRP Switch boxes on Pole with 2 nos, 15Amp kitkat fuse. JB shall be of minimum size 200x150x80 mm size suitable for loop in loop out of armoured 4Cx 16Sqmm Armoured cable.

18. Supply & embedding of 40mm dia GI Pipe (Medium class) during casting for Flood lighting & Street light pole. ((As per CPWD DSR (E&M)-2018, Item No. 11.6.2)

19. Supplying and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable as required. (As per CPWD DSR (E&M)-2018, Item No. 5.18)

20. Supply, Laying, termination, testing & commissioning of 4Cx16Sqmm Aluminium cable with round steel GI armoured wire XLPE insulated and PVC sheathed for 1.1kV insulation to IS7098 (Part-1). Cable to be laid in trench/wall with suitable size clamps/GI pipes as per site requirement. Termination shall be in bidder's scope and termination accessories i.e. lugs, gland etc. shall be supplied by bidder.

Notes for item 20:

i. The price for erection of cables shall include cable boxes, metallic glands, identification labels, terminal connectors, copper lugs and leading inducts or pipes as required.
ii. The price for erection shall include connecting up of the cable at either end. It shall also include clamping of the cable on steel supports fixed in the trenches, on the structures, on the frame work of the equipment or on the wall of the Control Room as required.
iii. For purposes of payment, fraction of a meter in total length of cable of each type used in a sub- station shall be rounded off to the nearest meter (0.5m or below being ignored).

21. Excavation of 450mm wide x750mm deep cable trench and refilling and resurfacing the same after laying of cable.

22. Supply & laying of RCC warning covers (including warning covers for 2.2kV cable laying) as per RDSO drawing

SP/SSP Building and Yard Lighting

1. Supply, Erection, testing & commissioning of Point Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable in recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box, 5A Socket and earthing the point with 1.5 sq.mm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable etc. as required. (As per CPWD DSR (E&M)-2018, Item No. 1.10.3)

   Following shall be deemed to be included in point wiring:

   a. Conduit/channel as the case may be, accessories for the same and wiring cables between the switch box and the point outlet, loop protective earthing of each fan/light fixture.
   b. All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.
   c. Metal or PVC switch boxes for control switches, regulators, sockets etc., recessed or surface type, and phenolic laminated sheet covers over the same.
   d. Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
   e. Control switch or MCB, as specified
   f. 3-pin or 6-pin socket, ceiling rose or connector as required. (2-pin and 5-pin socket outlet shall not be permitted.)
   g. Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
   h. Bushed conduit or porcelain tubing where wiring cables pass through wall etc.
   i. Interconnection wiring between switches within the switchbox on same circuit.
   j. There shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.

2. Supply, Erection, testing & commissioning of Point Wiring for light/ power plug with 2x4 sq. mm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable in surface/ recessed medium class PVC conduit along with 1 No. 4 sq. mm. FRLS PVC insulated, flexible, multistranded Cu conductor single core cable for loop earthing as required. (As per CPWD DSR (E&M)-2018, Item No. 1.14.3)

   Following shall be deemed to be included in point wiring:

   a. Conduit/channel as the case may be, accessories for the same and wiring cables between the Main Switchboard and the point outlet, looping cable between the Sockets, loop protective earthing of Socket.
   b. All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.
   c. Outlet boxes, junction boxes, pull-through boxes etc. for loose wires/conduit terminations.
   d. Connections to ceiling rose, connector, socket outlet etc.
   e. Bushed conduit or porcelain tubing where wiring cables pass through wall etc.
   f. The light plug (6A) point and power (16A) point wiring shall be measured on linear basis, from the respective tapping paint of live cable, namely, switch box, another socket outlet point or the sub-distribution board as the case may be up to the socket outlet. The Metal/PVC box and cover, Switch/MCB, Socket outlet Power point outlet shall be supplied separately.

3. Supply, Erection, testing & commissioning of outdoor 1x60W LED Street Light fitting complete. Connection of light from junction box will be done by 2x1.5 Sq.mm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable and 1x1.5Sqmm FRLS PVC insulated, flexible, multistranded Cu conductor single core cable for Earthing in GI Pipe with Clamp. All accessories, hardware as required for E&C shall be included in scope.

4. Supply, Erection testing & commissioning of Box Type LED tube light fitting 1x18/20 W Complete with all required mounting hardware etc. All accessories, hardware as required for E&C shall be included in scope.

5. Supply, Erection testing & commissioning of Ceiling Fan (1400mm) complete with D/Rod, canopy and Step type Electronic regulator (Appr. 300-600 W). Regulator shall be fixed on the switchboard next to Fan On-Off switch. Make - Bajaj, Crompton, Khaitan, Orient, Usha, Havells. All accessories, hardware like ceiling hooks etc. as required for E&C shall be included in scope.

6. Supply, Erection testing & commissioning of Exhaust Fan as per IS-2312, Single phase, 380 mm sweep, 1400 RPM complete with mounting arrangement, grills etc. for TSS battery room. All accessories, hardware as required for E&C shall be included in scope.

7. Supply, Erection, testing & commissioning of 2x15/5A Power socket 6/3 Pin Piano type complete with LED indicator. Make - Anchor, Reador, Roma.

8. Supply & Erection of Fireproof LED Light Fitting with Lamp 5/8 W complete with suitable holder

9. Supply, Erection, testing & commissioning of Point Wiring for circuit/ sub-main wiring along with earth wire with 2 x 6 sq. mm + 1 x 6 sq. mm earth wire of FRLS PVC insulated, flexible, multistranded Cu

conductor, single core cable in recessed medium class PVC conduit as required. (As per CPWD DSR (E&M)-2018, Item No. 1.14.4)

10. Supply, Erection, testing & commissioning of Sheet steel enclosed 20A MCB Controlled 3-Pin 20A Plug socket

11. Supply, Erection, Testing & Commissioning of Sheet steel Distribution board with 1 no. 63A DP incoming Switch and 3 nos. 32A SP, 3 Nos 6 A SP outgoing MCB with 1+1 Copper Busbars and 1 ON/OFF timers with DP 6A contactors for one Circuits & earth Busbar. Panel shall be suitable for wall cum floor mounting arrangements. Door shall be hinge type with suitable locking arrangement. Indication Neon lamp shall be provided for each MCB. Panel shall be fabricated using 14 SWG MS sheet and shall be powder coated confirming to relevant IS.

12. Supplying and fixing of 32 mm dia X 2.00 metres long G.I. pipe (medium class) bracket for mounting of fluorescent / HPMV / HPSV street light fitting on pole including bending the pipe to the required shape, 2 nos 40 mm X 3 mm flat iron clamps with nuts, bolts and washer, painting the flat iron with primer and finish paint etc. as required. (As per CPWD DSR (E&M)-2018, Item No. 12.34)

13. Supply & Erection of 9 Mtr Swaged tubelar pole (410SP32 as per IS 2713) with 1.5 Mtr arm suitable for mounting of street light fixture. Holes for Junction box, welded bottom plate 350x350x10mm and Stud for earthing should be done before painting & erection. The pole shall be coated with bituminous compound paint internally and externally up to the level which goes inside the earth. Exposed surface shall be coated with one coat of red oxide primer & finished with two coats of aluminum paint. All accessories, hardware as required for E&C shall be included in scope.

14. Supply, Erection Testing & commissioning of FRP Switch boxes on Pole with 2 nos., 15Amp kit Kat fuse. JB shall be of minimum size 200x150x80 mm size suitable for loop in loop out of armoured 4Cx 16Sqmm Armoured cable.

15. Supply & embedding of 40mm dia GI Pipe (Medium class) during casting for Flood lighting & Street light pole. (As per CPWD DSR (E&M)-2018, Item No. 11.6.2)

16. Supplying and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ sub main wiring/ cable as required. (As per CPWD DSR (E&M)-2018, Item No. 5.18)

17. Supply, Laying, termination, testing & commissioning of 4Cx16Sqmm Aluminium cable with round steel GI armoured wire XLPE insulated and PVC sheathed for 1.1kV insulation to IS7098 (Part-1). Cable to be laid in trench/wall with suitable size clamps/GI pipes as per site requirement. Termination shall be in bidder's scope and termination accessories i.e. lugs, gland etc. shall be supplied by bidder.

Notes for item 17:

i. The price for erection of cables shall include cable boxes, metallic glands, identification labels, terminal connectors, copper lugs and leading inducts or pipes as required.

ii. The price for erection shall include connecting up of the cable at either end. It shall also include clamping of the cable on steel supports fixed in the trenches, on the structures, on the frame work of the equipment or on the wall of the Control Room as required.
iii. For purposes of payment, fraction of a meter in total length of cable of each type used in a sub- station shall be rounded off to the nearest meter (0.5m or below being ignored).

18. Excavation of 450mm wide x750mm deep cable trench and refilling and resurfacing the same after laying of cable.

19. Supply & laying of RCC warning covers (including warning covers for 2.2kV cable laying) as per RDSO drawings.

5.5 TSS, SP, SSP – Civil Works

The work to be performed under the scope of this specification mainly consists of but not limited to complete scope of TSS, SP &SSP Civil works.

TSS, SP &SSP Civil works includes Excavation, backfilling, formwork, foundation work, super structure, boundary/fencing, retaining wall, approach road, sanitary & water fittings, transformer foundations and other services. etc., all complete as per drawings & RDSO, Core, ACTM & other railway standards,.

Any temporary activities required to complete the work. Making templates etc. for execution work is in contractor scope.

All approvals from statutory and local authorities etc. is in contractor's scope.

The plot for construction area/ fabrication yard/ field office/ construction stores has to be developed by the contractor of its own. All the infrastructure facilities which include roads, approaches, drainage system, pavements etc. shall be developed & provided by the contractor of its own.

5.5.1 The work will involve

All civil works connected with the above-mentioned structures such as earthwork, concrete work, formwork, embedment etc.

5.5.2 Exclusion

All works are in contractor's scope.

5.5.3 Civil works

The scope covers all civil works within the battery limits. The important works covered are as below.

a. Excavation of earth and backfilling including dewatering of excavations for foundations, trenches, tunnels pits, etc. till the construction of the same is completed and disposal of surplus.

b. Preparation and submission of detailed calculations, arrangement drawings of formwork, staging and scaffolding for all foundations as directed by the Engineer for his checking and approval.
c. Preparation of bar bending schedules for all foundation works with reinforcement etc and getting them approved by the BHEL Engineer.
d. Supply of all instruments and personnel for conducting necessary tests at site as specified/as directed by the Engineer.

5.5.4 **General**

a. The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.
b. Further, this is to be noted that the drawings and the documents furnished along with this specification are the sole property of B.H.E.L. It must not be used directly or indirectly in any way detrimental to the interest of the company.
c. The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraph and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.
d. The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual construction requirements.

5.5.5 **Also included in the scope**

Unless otherwise specified, the work to be provided by the contractor for the items mentioned in the "Schedule of items", shall include but not be limited to the following.

a. Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and from the site, fuel, electricity, compressed air, water, transit and storage insurance and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works.
b. Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The engineer for final incorporation in the works may retain the samples.
c. Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.
d. Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that are required for all works including temporary works.
e. Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.
f. Establishing levels and coordinates at suitable intervals from existing grid levels and coordinates furnished by the owner established bench marks, setting out the locations and levels of proposed structures, constructions and marking of reference pillars and other identification works etc., The contractor shall provide the owner/BHEL such a assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used.
g. Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.

h. Bidder is expected to get conversant with latest RDSO, Core, ACTM & other railway standards and drawings. All works are to be strictly executed as per railway standards and drawings. Bidder is requested to arrange railway standards and drawings on his own and no standards will be provided by BHEL.
i. Bidder to execute the work in consultation with Railway official and BHEL official. All required approvals as required to complete the work from Railway authorities shall be in bidder's scope. No extra payment shall be made for the same.
j. All works including excavation, back filling, formwork, reinforcement, concreting, curing, finishing etc shall be done as per drawings.
k. Detailed drawings shall be provided to successful bidder progressively during construction stage.

5.5.6 **Work by others**

No work under the specification will be provided by any agency other than the contractor unless specifically mentioned elsewhere in the contract.

5.5.7 **Specifications and Standards:**

Design Standards

The Railway Project including Project Facilities shall conform to design requirements set out in the following documents:

Indian Railways Permanent Way Manual, Indian Railway Bridge Manual, Indian Railway Schedule of Dimensions & relevant IRS Specifications referred in the Manual, Indian Railway Signaling Engineering Manual, Indian Railway Telecom Manual, AC Traction Manual.

Latest Version

Latest version of the Manuals, Specifications and Standards including the amendments notified/published by the Base Date shall be considered applicable.

Absence of specific provision

In the absence of any specific provision on any particular issue in the aforesaid Manuals, Specifications, or Standards, the following standards shall apply in order of priority.

Bureau of Indian Standards (BIS) Euro Codes or British Standards or American Standards
Any other specifications/standards proposed by the Contractor and reviewed by the Authority's Engineer.

Specifications and Standards

All Materials, works and construction operations shall conform to the following manuals:

For civil works:

(a) Indian Railways Permanent Way Manual
(b) Indian Railway Bridge Manual
(c) Indian Railway Schedule of Dimensions
(d) The relevant IRS Specifications
(e) Specifications of Works of concerned zonal railway

Bidder to note that above list is not exhaustive and other railway standards as required for OHE foundation works shall be applicable for the works.

In case of any contradiction in the various codal provisions, the order of precedence shall be as follows:-
aa) Provisions of RDSO tender document
bb) IRS Codal provisions
cc) IRC Codal provisions
dd) IS (BIS) Codal provisions

RDSO standards

(C) STANDARD TYPICAL AND PARTICULAR DRAWINGS FOR TSS AND SHUNT CAPACITOR BANKS.

1	2	3	4	5
238	Typical layout of Remote Control cubicle at a switching station	ETI/PSI	0010	E
239	Typical layout of 132 /27kv Traction sub-station (Type-I)	TI/DRG/PSI/TSSLO/RDSO/	00001/01	0
240	Typical layout of 132 /27kv Traction sub-station (Type-II)	TI/DRG/PSI/TSSLO/RDSO/	00002/01/0	-
241	Typical layout of 132 /27kv Traction sub-station (Type-III)	TI/DRG/PSI/TSSLO/RDSO/	00003/02	0
242	Typical layout of 132/27kv Traction Sub-station	TI/DRG/PSI/TSSLO/R	00004/02	0

1	2	3	4	5
	(Type IV) (with outgoing feeders and metering Facilities)	DSO/		
243	Typical layout of 132/27kv Traction Sub-station (Type V)	TI/DRG/PSI/TSSLO/RDSO/	00005/02	0
244	Typical layout of 132/27kV traction sub-station (Type VI)	TI/DRG/PSI/TSSLO/RDSO/	00006/02	0
245	Typical layout of 132/27kV traction sub-station (Type VII)	TI/DRG/PSI/TSSLO/RDSO/	00007/02	0
246	Typical layout of 132/27kV traction sub-station (Type-VIII)	TI/DRG/PSI/TSSLO/RDSO/	000008/02	-
247	Typical layout of 132/27kV traction sub station with single transformer (Type -IX)	TI/DRG/PSI/TSSLO/RDSO/	00009/02	0
248	Typical layout of 132/27kv Traction Sub-station with 132kv Switching Station (Type x)	TI/DRG/PSI/TSSLO/RDSO/	00010/02	0
249	Typical layout of Control Room at traction sub-station.	TI/DRG/PSI/CPROOM/RDSO/	00001/01	0

250	Standard plan of control room at traction sub-station (General arrangement and RCC details)	RE/Civil/	S-144/06	0
251	Typical return current connection to buried rail at 132/25kv Traction sub-station	ETI/PSI	0212-1	Nil
252	Typical general arrangement of earth screen wire termination at Traction substation	ETI/PSI	0225	C
253	Typical termination arrangement for strung bus "Spider" (AAC) conductor at TSS.	ETI/PSI	0226	B
254	General arrangement & terminal connection for 25kV PT Type-II at TSS	ETI/PSI	0227	A
255	General arrangement and terminal connection for 25kV Potential Transformer at TSS (220kV)	ETI/PSI	0227-1	Nil
256	Typical layout of 220/27kV traction sub station (Type -I)	ETI/PSI	0240-1	Nil
257	Typical return current connection to buried rail at 220/25kV TSS.	ETI/PSI	0242	A
258	Typical termination arrangement for strung bus (ZEBRA ACSR) conductor at TSS (220kV)	ETI/PSI	0243	A
259	Typical general arrangement of earth screen wire termination at 220/25kV traction sub-station.	ETI/PSI	0244	Nil
260	Mounting arrangement of 100KVA 25kv/240V LT supply transformer at TSS	ETI/PSI	0312	B
261	25kv D.O. Fuse switch assembly	ETI/PSI	032	D
262	Typical fencing layout at traction Sub-station (Details of fencing panel, door, anticlimbing device etc.)	ETI/PSI	121	F
263	Typical arrangement of an earth electrode	ETI/PSI	222-1	Nil
264	Typical earthing, cable trench & foundation layout of 132/25kv TSS	ETI/PSI	224	E
265	Typical earthing arrangement for equipment/ structure at TSS	ETI/PSI	228	A
266	Typical earthing cable trench and foundation layout of 132/25kV traction sub-station with Shunt Capacitor bay	ETI/PSI	229	Nil
267	Typical details of cable run at a two transformer TSS	ETI/PSI	323	E
268	Part Plan for Details of position of feeder Bus coupling interrupter at TSS	ETI/PSI/SK	272	Nil
269	Terminal connector for 220kV equipments (Typical drawing)	ETI/PSI/SK	324	Nil
270	Typical schematic diagram of protection for double Transformer traction sub station	ETI/PSI	024-1	Nil
271	Typical layout for 25kv Shunt capacitor with series reactor to be installed at 132/25kv TSS	ETI/PSI	0223	E
272	High speed auto reclosing scheme for feeder circuit breaker at 25kV A.C TSS	ETI/PSI	0231-1	A

1	2	3	4	5
273	Typical details of cable run at a two transformer TSS with Shunt Capacitor	ETI/PSI	325	Nil
274	Typical details of cable run at two transformers Traction Sub-station with Shunt capacitor (220kV)	ETI/PSI	326	Nil
275	General Scheme of supply for 25kV, 50 Hz single phase traction system	ETI/PSI	702-1	D
276	Standard Post Insulator for clean area (Creepage path 850mm min)	ETI/OHE/P	6090-1	C
277	Typical number plate for circuit breaker	ETI/PSI/P	7523	Nil
278	Typical number plate for Auxiliary Transformer	ETI/PSI/P	7525	Nil
279	Typical number plate for Power transformer at TSS	ETI/PSI/P	7526	Nil
280	Typical number plate for PT at TSS	ETI/PSI/P	7527	A
281	Typical number plate for CT at TSS	ETI/PSI/P	7528	A
282	Typical number plate for Isolators at TSS	ETI/PSI/P	7529	A
283	Bimetallic terminal connector to suit 'ZEBRA' ACSR conductor and 30 dia Cu stud of CT/CB/traction power transformer.	ETI/PSI/P	11010	C
284	220kV system bimetallic terminal connector to suit 'ZEBRA' (28.58 Dia) ACSR conductor & Al./Cu. pad of Isolator /CT/CB.	ETI/PSI/P	11030	C
285	220kV system tee connector to suit 'ZEBRA' (28.58 dia) ACSR conductor on both ways.	ETI/PSI/P	11040	C
286	220kV system rigid connector on SI to suit ZEBRA (28.58 dia) ACSR conductor	ETI/PSI/P	11050	C
287	Details of expansion type terminal connector to suit 50 dia Al. tubular busbar to terminal pad of 25kv CT/ Isolator/ CB and Interrupter	ETI/PSI/P	11060 Sh.2 of 2	E
288	Detail of rigid type bimetallic terminal connector suitable for 50 dia Al. tubular busbar to 30 dia Cu. Stud of 25kV CT.	ETI/PSI/P	11070	B
289	Rigid bimetallic terminal connector suitable for 50 dia Al. tubular busbar to terminal pad of 25kv Isolator/ CT	ETI/PSI/P	11090	C
290	Rigid through connector to suit 50 dia Al. Tubular bus bar and 'SPIDER' AAC conductor for 25kv PT Type-II	ETI/PSI/P	11110	C
291	Details of Rigid terminal connector suitable for 20 dia Al. Conductor to terminal pad of 25kv PT Type I & II	ETI/PSI/P	11120	C
292	25kv system tee connector to suit 50 O/D Al. Tube and 'SPIDER' 'AAC' conductor	ETI/PSI/P	11140	B
293	25 K.V system Tee connector to suit 50. O/D AL. tubular busbar to 50. O/D AL. tubular busbar	ETI/PSI/P	11150	B
294	25Kv System Rigid bus splice connector to suit 50 O/D Al. tube on both ways	ETI/PSI/P	11180	B
295	25 kV System Sliding clamp for 50mm O/D Aluminium Bus bar	ETI/PSI/P	11190	C

296	25Kv System Rigid connector on S.I to suit 50 mm O/D Al. Bus bar	ETI/PSI/P	11200	C
297	25kv system expansion bus coupler on SI to suit 50 O/D Al. tube.	ETI/PSI/P	11210	D
298	Typical fencing , door and anticlimbing device details of traction sub-station	CORE/ALD/PSI	01	D
299	Structural layout of 132/25 KV traction sub-stations	ETI/C	0200, SH.No.-1	H
300	Structural layouts of 132/25kv traction sub-stations	ETI/C	0200, SH.No.-2	D
301	Details of Beam B/1 for 132/25 KV TSS	ETI/C	0201	D
302	Details of Tower T 1 for 132/25 KV TSS	ETI/C	0202	H
303	Details of Tower T 2 for 132/25 KV TSS	ETI/C	0203	G
304	Details of beam B/2 and column C/1 for	ETI/C	0208	E

1	2	3	4	5
	132/25kV traction sub-station.			
305	Typical cable trench and foundation lay out of 132/25kv TSS	ETI/C	0210	F
306	Details of baffle wall at TSS(WP-112.5kg/sq.m) and WP (75kg/sq.m)	ETI/C	0213	D
307	Details of RCC baffle Wall at TSS(WP-150kg/sq.m)	ETI/C	0214	B
308	Transformer oil drainage arrangement at sub-stations	ETI/C	0216	B
309	Line Diagram of Structural layouts of 220/25kV Traction sub-station	ETI/C	0222	Nil
310	Structural layout of 220/27kV traction sub-station (Type-I)	ETI/C	0222-1	Nil
311	Control Room for Traction substation	ETI/C	0225 Sheet-1	Nil
312	Control Room for Traction Sub-station(RCC details)	ETI/C	0225 Sheet-2	Nil
313	Details of structure for 132kv double pole Isolator	ETI/C	0310	G
314	Details of structure for 132kv support insulators	ETI/C	0320	E
315	Details of structure for 132kv Current transformer	ETI/C	0330	F
316	Details of structure for 120kv Lightning Arrestor	ETI/C	0340	F
317	Details of structure for 25kv Current transformer	ETI/C	0360	F
318	Details of structure for 42kv ,10KA LA & 25kv support insulator	ETI/C	0370 Sheet-1	J
319	Black Weight of Structure for 42kv,10KA LA & 25kv support insulator.	ETI/C	0370 Sheet-2	Nil
320	Details of structure for 25kv Single Pole isolator	ETI/C	0380	F

321	Details of structure for 25kv Potential transformer	ETI/C	0390	E
322	S-100 Fabricated Mast for mounting LT supply transformer and DO fuse switch at switching station	ETI/C	0043	B
323	Details of structure and foundation for 25kV DP Isolator at TSS	ETI/SK/C	0180	C
324	Gillsans Letters and Figures	RE/33	527	A
325	Typical schematic diagram of protection for single transformer traction sub-station	ETI/PSI	0228-1	Nil
326	25 kV drop out fuse switch details	ETI/PSI	038	C
327	Operating pole for 25kV drop out fuse switch	ETI/PSI	039	B
328	Typical schematic diagram for TSS, FP, SSP and SP with 21.6 MVA or 30 MVA transformer for three lines.	TI/DRG/PSI/3L-TSS/RDSO	00001/07	1
329	Scheme of locking /Interlocking arrangement of 132 kV Isolator at Traction Sub-Station.	ETI/PSI	5212	B
330	Typical return current connection to buried rail at 132 kV/25 kV Traction Sub-Station.	ETI/PSI	0212-1	Nil
331	Typical arrangement of an earth electrode.	ETI/PSI	222-1	Nil
332	Flexible connector for 25 kV circuit breaker 25kV Interrupter & 25 kV side of 13.5/20 MVA traction transformer.	ETI/PSI/P	6570	F
333	Scheme of Interlocking arrangement for 25kV circuit breakers at Traction Sub-Station	ETI/PSI	5214	B
334	Expansion type terminal connector for 25 kV, 60mm dia terminal for traction power transformer.	ETI/PSI/P	11220	D

Note:
The above list is indicative and not exhaustive and bidder is expected to get conversant with latest RDSO, Core, ACTM & railway standards and drawings. All works are to be strictly executed as per Railway standards and drawings. Bidder is requested to arrange Railway standards and drawings on his own and no standards will be provided by BHEL.

5.5.8 **Preamble for the schedule of quantities.**

a. Details of the items in this Schedule shall be read in conjunction with the corresponding Railway specifications, drawings and other documents and shall have precedence over any contrary statement mentioned anywhere in this document.

b. The work shall be carried out as per construction drawings, specifications, the description of the items in this schedule and/or Engineer's instructions. Drawings enclosed with these documents are only indicative giving some idea of the type of work involved. The layout, sizes and details of the building, structures and foundations shown in tender drawings may vary at a large extent during actual construction. Final drawings will be issued progressively during the execution of the work.

c. Items of work provided in this schedule but not covered in the specifications shall be executed strictly as per instructions of the Engineer.

d. Unless specifically mentioned otherwise in the contract, the bidder shall quote his rates for the finished items and shall provide for the complete cost towards fuel, tools, tackle, equipment, constructional plant , temporary works, labour materials, levies , taxes , transport, layout, repairs, rectification, maintenance till handing over, supervision, shops, establishments, services , temporary roads, revenue expenses, contingencies, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the works according to the contract.

e. The rate quoted shall be inclusive of cleaning the site of any vegetations, dressing and leveling etc., required for commencement of site activities. No separate payment will be made towards the same.

f. The rate shall also be inclusive of carrying out survey of site to establish levels and coordinates at suitable intervals, form existing grid levels and coordinates furnished by the owner, establish bench marks, setting out the location and levels of the proposed structures, constructions and making references, pillars and other identification marks etc. No separate payment will be made towards the same.

g. The quantities of the various items mentioned in the schedule are approximate and may vary up to any extent or be deleted altogether. The quoted rates of each item shall remain firm as long as the variation in the total value of the works remain within ±30% (Thirty percent) of the Bid Price of the work. The contractor extent
h. of the work to be executed under any particular item in this schedule, before, under
i. taking any preliminary work or purchasing bought out component related to the work.

j. Rates shall be quoted both in figures and in words in clear legible writing. No over writing is allowed. All scoring and cancellation should be counter signed by the bidder. In case of illegibility, the interpretation of the engineer shall be final. All entries shall be in English language.

k. Engineer's decision shall be final and binding on the contractors regarding clarification of items in this schedule with respect to the other section of the contract.

l. Incase of any discrepancy between item descriptions, relevant drawing and/ or specification clarification shall be sought at tender stage itself. Otherwise it shall be assumed that the bidder has quoted for the more stringent requirement.

m. The price also includes dismantling of all connected temporary arrangements, back filling with earth and compacting the same to the required height and width as per drawing to ensure safety of foundation, confining the exposed height of foundation block to within 10 cm., and removal of spoil. The BHEL's Engineer shall certify where use of chisel and hammer has been necessary.

Chapter VI- Quality

1) Introduction

This part of the specification covers the sampling, testing and quality assurance requirement for all civil and structural works covered in this specification.
This part of the technical specification shall be read with other parts of the technical specifications, general condition of contract and special condition of contract, which covers common QA requirements. Wherever IS code or RDSO standards have been referred they shall be the latest revisions.

The QA and QC activities in all respects as specified in the technical specifications/ drawings / data sheets /quality plans / contract documents shall be carried out at no extra cost to the owner. The contractor shall prepare detailed construction and erection methodology scheme which shall be compatible to the requirements of the desired progress of work execution, quality measures, prior approvals if any and the same shall be got approved by the BHEL and Railway. If required, work methodology may be revised/reviewed at every stage of execution of work at site, to suit the site conditions by the contractor at no extra cost to the owner.

2) Quality control system

The Contractor shall establish a quality control mechanism to ensure compliance with the provisions of this Agreement (the "Quality Assurance Plan" or "QAP") in accordance with ISO-9001.

The Contractor shall submit to the Railway and BHEL and take approval its Quality Assurance Plan from Railway which shall include the following:
(a) organisation, duties and responsibilities, procedures, inspections and documentation;
(b) quality control mechanism including sampling and testing of Materials, test frequencies, standards, acceptance criteria, testing facilities, reporting, recording and interpretation of test results, approvals, check list for site activities, and proforma for testing and calibration in accordance with the Specifications and Standards and Good Industry Practice; and
(c) internal quality audit system.

3) QA and QC Manpower

The contractor shall appoint adequate work force at site. Contractor shall give details organization chart and appointed manpower details for BHEL approval /acceptance. The contractor shall appoint a dedicated, experienced and competent QA&QC in charge at site. The contractor shall nominate one overall QA coordinator for the contract detailing the name, designation, contact details and address at the time of post bid discussions. All correspondence related to Quality Assurance shall

be addressed by the contractors QA coordinator to BHEL. BHEL shall address all correspondence related to Quality issues to the contractors QA coordinator.

4) Laboratory and Field Testing

The field laboratory for QA and QC activities shall be constructed and set-up by the contractor. The Laboratory shall be constructed and installed with the adequate facilities to meet the requirement of envisaged test set up as per RDSO standard requirement. Temperature and humidity controls shall be available wherever necessary during testing of samples. The contractor shall deploy and equip the field quality laboratory for meeting the field quality plan requirements.

The contractor shall furnish a comprehensive list of testing equipment's / instrument required to meet the planned/scheduled tests for the execution of works for BHEL acceptance/ approval. The contractor shall mobilize the requisite laboratory equipment and QA&QC manpower at least 15days prior to the planned test activity as per the schedule of tests. All equipment's and instruments in the field shall be calibrated before the commencement of tests and then at regular intervals, as per the manufacturer's recommendation and as directed by the BHEL. The calibration certificates shall specify the fitness of the equipment's and instruments within the limit of tolerance for use. Contractor shall arrange for calibration of equipment's and instruments by an NABL / NPL accredited agency and the calibration report shall be submitted to BHEL.

5) Sampling And Testing of Construction Materials

The method of sampling for testing of construction materials and work / job samples shall be as per the relevant IS / RDSO standards in line with the requirements of the technical specification / quality plans. The contractor shall carry out testing in accordance with the RDSO standards in line with the requirements of the technical specifications and quality plans.

Where no specific testing procedure is mentioned, the tests shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer. All testing shall be done in the presence of the engineer or his authorized representative in a NABL accredited / Govt. Laboratory acceptable to BHEL and Railway.

6) Methodology

The Contractor shall, at least 15 (fifteen) days prior to the commencement of Construction, submit to the railway for review and approval the methodology proposed to be adopted for executing the Works, giving details of equipment to be deployed, traffic management and measures for ensuring safety.

7) Inspection and review by the Railway

The Railway or any representative authorised by the Railway in this behalf may inspect and review the progress and quality of the construction of Works and issue

appropriate directions to the Contractor for taking remedial action in the event the Works are not in accordance with the provisions.

8) Inspection of Works and Test

The BHEL/Railway and its authorised representative shall at all times:
(a) have full access to all parts of the Site and to all places from which natural Materials are being obtained for use in the Works; and
(b) during production, manufacture and construction at the Site and at the place of production, be entitled to examine, inspect, measure and test the Materials and workmanship, and to check the progress of manufacture of Materials.

For determining that the Works conform to the Specifications and Standards, the Railway and BHEL shall require the Contractor to carry out or cause to be carried out tests, at such time and frequency and in such manner as specified in this Agreement, and in accordance with Good Industry Practice for quality assurance. The Contractor shall, with due diligence, carry out all the tests in accordance with the Agreement and furnish the results thereof to the Railway and BHEL. Of the total tests for each category or type to be undertaken by the Contractor under the provisions of this Agreement and Good Industry Practice, the Authority's Engineer shall (a) carry out or cause to be carried out, test checks equal to about 10% (ten per cent) of the number of the tests required to be undertaken by the Contractor; and (b) witness or participate in at least 10% (ten per cent) of the number of such tests conducted or caused to be conducted by the Contractor.

9) Inspection of records

The Railway and BHEL shall have the right to inspect the records of the Contractor relating to the Works.

10) Monthly progress reports

During the Construction Period, the Contractor shall, no later than 10 (ten) days after the close of each month, furnish to the Railway and BHEL a monthly report on the progress of Works and shall promptly give such other relevant information as may be required by the Railway.

11) Purchase And Service

All Material shall be procured from RDSO approved vendor list.

12) Field Quality Plan

The contractor shall prepare the FQP in line with RDSO standard and take prior approval from BHEL and Railway.

13) Quality control records

The Contractor shall hand over to the BHEL a copy of all its quality control records and documents before the Completion Certificate.

14) General QA Requirements

The contractor shall ensure that the works, BOIs and services under the scope of contract at site or at any other place of work are in accordance with the BHEL technical specification, RDSO standards, approved drawings / data sheets / quality plans and BOQ. All the works, BOIs and services shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer.

The contractor shall Carried out the laboratory and field tests and carry out independent tests in the site laboratory, wherever necessary (All tests are to be strictly executed as per RDSO standards. The tests which cannot be carried out in the site laboratory shall be done at a laboratory as per RDSO standard. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by BHEL engineer and Railway. The test report along with the recommendations shall be obtained from the laboratories without delay and submitted to BHEL and Railway.

The contractor shall Maintain records of all testing, including cross referencing to items of work to which each test refers and the location from which any samples were obtained for testing.

Chapter VII: Indicative Map