

**Ministry of Railways
West Central Railway**

Feasibility Report

For

Provision of EI in lieu of existing PI at Surgaon Banjari, Charkheda Khurd, Chhanera, Barud, Dagarkheri, Itarsi-B cabin and Bir stations (7 stations) involving indoor and outdoor signalling and telecom work including construction of EI buildings, general lighting, provision of AT etc. in HDN/HUN routes in ET-KNW section of Bhopal Division, West Central Railway.

on

Engineering, Procurement & Construction (EPC)

Signal & Telecommunication Department

TABLE OF CONTENTS

Section	Content	Page No.
1.	Project Description	3
2.	Considered Technical Requirement & Policy	9
3.	Scope of work as considered for Signalling & Telecommunication	11
4	Scope of work - Civil	32
4.	Scope of work - Electrical General	36
5.	Scope of work - Electrical TRD	50
6.	Annexures	58
	General requirements	67

SECTION-I: PROJECT DESCRIPTION

1.0 INTRODUCTION:

Electronic Interlocking has the advantage of doing away with multiple relays, relay racks, easier alteration in indoor signalling system, faster response time, lesser space requirement among others. The signalling gears are operated from VDU with dual stand by arrangement. Centralized EI arrangement is preferred as per extant policy of Railway board and WCR.

This work involves Designing, Manufacturing, Supply, Installation, Testing, and Commissioning of Microprocessor based EI system for execution of indoor and outdoor signalling & telecommunication work which includes excavation of trench, laying of cables, casting of foundation of MACLS signals & apparatus cases, erection/installation of MACLS signals, fixing & wiring of track circuits & Fixing/wiring of point machines, centralized operation of points & signals, block working, SSDAC/MADAC etc. as per RE standard and latest applicable policies of Railway Board, RDSO and WCR-HQ. It also includes Construction and Electrification of service buildings.

Presently, Surgaon Banjari, Charkheda Khurd, Chhanera, Barud, Dagarkheri, Itarsi-B cabin and Bir stations are provided with metal to metal-based Route relay interlocking. As per Railway board guidelines, electronic interlocking is to be provided at stations in the HDN/HUN route. The section from Itarsi to Khandwa is a double line section and this section is also proposed with KAVACH for which tender is already awarded by this unit. TLV-BIR and SGBJ-BIR are single line sections and this section is also proposed with KAVACH for which tender is already awarded by this unit.

1.1 PROJECT NAME:

Bhopal division: Provision of EI in lieu of existing PI at Surgaon Banjari, Charkheda Khurd, Chhanera, Barud, Dagarkheri, Itarsi-B cabin and Bir stations (7 stations) involving indoor and outdoor signalling and telecommunication work including construction of EI buildings, general lighting, provision of AT, etc. in HDN/HUN routes in ET-KNW section of Bhopal Division, West Central Railway.

1.2 SECTION DETAILS:

S. No.	Description	Details
Section - ITARSI (ET) – KHANDWA (KNW)		
1.	Route	“B” Route: ET-KNW
2.	Single/Double/Triple Line	Double line section
3.	No. of Stations	06
4.	No. of LC Gates controlled by station	NIL
5.	Electrification	Entire block section is electrified
Section – SURGAON BANJARI (SGBJ) – BIR (BIR) & Talvadiya (TLV) – BIR (BIR)		
6.	Single/Double/Triple Line	Single line section
7.	No. of Stations	01
8.	No. of LC Gates controlled by station	01
9.	Electrification	Entire block section is electrified

1.3 PRESENT SIGNALING SYSTEM:

- 1.3.1 Surgaon Banjari, Charkheda Khurd, Chhanera, Barud, Dagarkheri, Itarsi-B cabin and Bir stations are provided with metal to metal-based Route relay interlocking.

1.3.2 The ET-KNW section has a Double Line and SGBJ-BIR has a single line. The system of working in these sections is Absolute Block Working and in future Automatic Block signalling is also proposed in ET-KNW main line section.

1.3.3 Surgaon Banjari, Charkheda Khurd, Chhanera, Barud, Dagarkheri, Itarsi-B cabin has Standard-III(R) Interlocking. BIR station has Standard-II(R) Interlocking.

1.4 Level Crossing Gates: Interlocked traffic LC gate No. 190 is connected from BIR station.

LC No.	Section	Km No.	Connected from
LC 190	TLV-BIR	600/29-31	BIR station

1.5 Details of the Tentative Signaling System at Stations is tabulated below:

S. No.	Gear Name	Unit	ITARSI - B	DAGAR KHERI	BARUD	CHHANERA	CHARKHERA KHURD	SURGA ON BANJAR I	BIR
1	Kms.	-	739	632.700	623.050	621.700	605.250	593.910	601.000
2	SIP No.	-	4517	4502	4501	4499	4498	4495	4514
3	No. of Routes	No.	21	39	39	45	39	99	62
4	Point-Single Ended	No.	1	0	0	0	0	3	5
5	Point-Double Ended	No.	2	8	8	10	8	15	7
6	Signal-2 Aspect	No.	3	9	9	7	8	20	13
7	Signal-3 Aspect	No.	3	9	9	8	7	10	1
8	Signal-4 Aspect	No.	2	0	0	0	0	0	0
9	Dependent Shunt	No.	2	4	4	1	4	6	5
10	Independent Shunt	No.	2	7	7	11	7	7	8
11	Calling On	No.	5	2	2	2	2	3	2
12	1-way Route Indicator	No.	0	1	1	1	1	1	4
13	2-way Route Indicator	No.	3	1	1	0	1	0	0
14	3-way Route Indicator	No.	0	0	0	1	0	1	1

15	5-way Route Indicator	No.	0	0	0	0	0	1	0
16	Track circuit	No.	19	29	29	31	29	51	33
17	MSDAC Track circuit	No.	16	20	20	31	20	23	33

NOTE: These details shall be re-verified by the bidder/tenderer before start of work as per approved SIP attached with the tender and work has to be executed as per approved SIP within this scope of work.

1.6 Details of Minor/Major Bridge:

S. No.	Section	BR. No.	Lying between Block Section	Road/ No. of lines	LOCATION (Hectometer)	LOCATION	SPAN	Water Way	Classification of Br. IMP/ MAJ/ MIN (Revised in BMS)	TYP E OF BR.
1	KNW-ET	590/1	TLV-SGBJ	UP/ DN	590/648-651	590/20-22	03.05*1	Water Way	MIN	RCC SLAB
2	KNW-ET	591/1	TLV-SGBJ	UP/ DN	591/297-299	591/8-10	01.83*1	Water Way	MIN	RCC SLAB
3	KNW-ET	592/1	TLV-SGBJ	UP/ DN	592/066-068	592/2-4	01.83*1	Water Way	MIN	RCC SLAB
4	KNW-ET	592/2	TLV-SGBJ	UP/ DN	592/852-855	592/34-36	01.83*1	Water Way	MIN	RCC SLAB
5	KNW-ET	593/1	TLV-SGBJ	UP/ DN	593/642-645	593/24-26	02.44*1	Water Way	MIN	RCC SLAB
6	KNW-ET	594/1	SGBJ-CKKD	UP/ DN	594/321-326	594/10-12	04.57*1	Water Way	MIN	RCC SLAB
7	KNW-ET	594/2	SGBJ-CKKD	UP/ DN	594/630-634	594/26-28	03.05*1	Water Way	MIN	RCC SLAB
8	KNW-ET	595/1	SGBJ-CKKD	UP/ DN	595/245-248	595/8-10	03.05*1	Water Way	MIN	RCC SLAB
9	KNW-ET	596/1	SGBJ-CKKD	UP/ DN	596/065-071	596/2-4	06.10*1	RUB	MIN	RCC SLAB
10	KNW-ET	596/2	SGBJ-CKKD	UP/ DN	596/917-920	596/26-28	03.05*1	Water Way	MIN	RCC SLAB
11	KNW-ET	602/1	SGBJ-CKKD	UP/ DN	602/265-270	602/10-12	04.57*1	RUB	MIN	BOX CUL
12	KNW-ET	603/1	SGBJ-CKKD	UP/ DN	603/003-186	602/34-603/10	18.30*9	Water Way	MAJ	COMP OSITE
13	KNW-ET	604/1	SGBJ-CKKD	UP/ DN	604/981-982	604/36-605/2	01.20*1	Water Way	MIN	PIPE (HUME)
14	KNW-ET	605/1	SGBJ-CKKD	UP/ DN	605/166-167	605/6-8	01.20*1	Water Way	MIN	PIPE (HUME)
15	KNW-ET	605/2	CKKD-CAER	UP/ DN	605/547-549	605/20-22	02.00*1	Water Way	MIN	RCC SLAB
16	KNW-ET	606/1	CKKD-CAER	UP/ DN	606/060-062	606/2-4	01.20*2	Water Way	MIN	PIPE (HUME)
17	KNW-ET	606/2	CKKD-CAER	UP/ DN	606/078-082	606/2-4	04.00*1	RUB	MIN	BOX CUL
18	KNW-ET	606/3	CKKD-CAER	UP/ DN	606/988-991	606/34-607/2	03.00*1	Water Way	MIN	RCC SLAB

19	KNW-ET	607/1	CKKD-CAER	UP/ DN	606/024-029	606/34-607/2	05.00*1	RUB	MIN	BOX CUL
20	KNW-ET	607/2	CKKD-CAER	UP/ DN	607/724-727	607/20-22	02.50*1	Water Way	MIN	RCC SLAB
21	KNW-ET	610/1	CKKD-CAER	UP/ DN	610/135-143	610/4-6	03.50*2	Water Way	MIN	RCC SLAB
22	KNW-ET	610/2 (ROB Channera)	CKKD-CAER	UP/ DN	610/520-554	610/16-18	(22.50*1 +	ROB	ROB	PSC GIRDER + RCC SLAB (ROB)
							06.00*2)			
23	KNW-ET	611/1	CKKD-CAER	UP/ DN	611/018-020)	611/1-3	02.00*1	Water Way	MIN	BOX CUL
24	KNW-ET	611/2	CKKD-CAER	UP/ DN	611/144-146	611/5-7	02.00*1	Water Way	MIN	BOX CUL
25	KNW-ET	612/1	CAER-BRUD	UP/ DN	612/034-042	612/36-613/2	05.00*1	Water Way	MIN	RCC SLAB
26	KNW-ET	612/ A1 (FOB Chhanera)	Chhanera Station	LN 3	612.771	612/771-774	[21.60*1]	FOB	FOB	FOB(S TEEL)
27	KNW-ET	614/1	CAER-BRUD	UP/ DN	614/064-070	614/2-4	06.00*1	RUB	MIN	BOX CUL
28	KNW-ET	614/2	CAER-BRUD	UP/ DN	614/117-119	614/117-119	02.00*1	Water Way	MIN	RCC SLAB
29	KNW-ET	614/3	CAER-BRUD	UP/ DN	614/918-927	614/28-30	04.50*2	Water Way	MIN	BOX CUL
30	KNW-ET	615/1	CAER-BRUD	UP/ DN	615/228-232	615/6-8	04.00*1	RUB	MIN	BOX CUL
31	KNW-ET	620/2	CAER-BRUD	UP/ DN	621/837-841	621/837-841	04.50*1	Water Way	MIN	RCC SLAB
32	KNW-ET	621/1	CAER-BRUD	UP/ DN	621/382-386	621/12-14	03.00*1	Water Way	MIN	RCC SLAB
33	KNW-ET	621/2	CAER-BRUD	UP/ DN	621/750-804	621/24-26	18.30*3	Water Way	MAJ	COMP OSITE
34	KNW-ET	622/1	CAER-BRUD	UP/ DN	622/683-688	622/28-30	04.57*1	RUB	MIN	BOX CUL
35	KNW-ET	623/1	BRUD-DGRI	UP/ DN	623/230-234	623/10-12	03.50*1	Water Way	MIN	RCC SLAB
36	KNW-ET	623/2	BRUD-DGRI	UP/ DN	623/391-400	623/18-20	04.00*2	Water Way	MIN	RCC SLAB
37	KNW-ET	624/1	BRUD-DGRI	UP/ DN	624/861-866	624/22-24	04.50*1	Water Way	MIN	RCC SLAB
38	KNW-ET	625/1	BRUD-DGRI	UP/ DN	625/407-409	625/14-16	02.00*1	Water Way	MIN	RCC SLAB
39	KNW-ET	626/1	BRUD-DGRI	UP/ DN	626/251-253	626/8-10	02.00*1	Water Way	MIN	RCC SLAB
40	KNW-ET	630/1	BRUD-DGRI	UP/ DN	630/400-528	630/10-18	18.30*7	Water Way	MAJ	COMP OSITE
41	KNW-ET	631/1	BRUD-DGRI	UP/ DN	631/170-632.175	631/6-8	04.57*1	Water Way	MIN	RCC SLAB
42	KNW-ET	632/1	BRUD-DGRI	UP/ DN	632/070-075	632/4-6	04.57*1	Water Way	MIN	RCC SLAB
43	KNW-ET	632/2	DGRI-KKN	UP/ DN	632/815-821	632/30-32	06.10*1	Water Way	MIN	RCC SLAB
44	KNW-ET	633/1	DGRI-KKN	UP/ DN	633/770-775	633/30-32	04.50*3	Water Way	MIN	RCC SLAB
45	KNW-ET	634/1	DGRI-KKN	UP/ DN	635/040-046	634/32-34	06.10*1	Water Way	MIN	RCC SLAB
46	KNW-ET	634 A/1	DGRI-KKN	UP/ DN	634/A 634-647	634/A 10-20	18.30*9	Water Way	MAJ	COMP OSITE

47	KNW-ET	634B/1	DGRI-KKN	UP/ DN	634/B 195-209	634/B 6-8	04.50*3	Water Way	MIN	RCC SLAB
48	KNW-ET	634C/1	DGRI-KKN	UP/ DN	634/C 065-067	634/C 2-4	01.50*1	Water Way	MIN	RCC SLAB
49	KNW-ET	634C/2	DGRI-KKN	UP/ DN	634/C 130-135	634/C4-6	05.00*1	RUB	MIN	BOX CUL
50	KNW-ET	634C/3	DGRI-KKN	UP/ DN	634/C 455-457	634/C 14-16	01.50*1	Water Way	MIN	RCC SLAB
51	KNW-ET	634 C/4	DGRI-KKN	UP/ DN	634/C 845-847	634/C 26-28	01.50*1	Water Way	MIN	RCC SLAB
52	KNW-ET	634 D/1	DGRI-KKN	UP/ DN	634/ D 650-651	634/ D 20-22	01.00*1	Water Way	MIN	RCC SLAB
53	KNW-ET	634E/1	DGRI-KKN	UP/ DN	634/ E 715-724	634/ E 22-24	03.00*3	Water Way	MIN	RCC SLAB
54	KNW-ET	634E/2	DGRI-KKN	UP/ DN	634/E 780-785	634/E 24-26	05.00*1	RUB	MIN	BOX CUL
55	KNW-ET	634F/1	DGRI-KKN	UP/ DN	634/F 390-391	634/F 12-14	01.00*1	Water Way	MIN	RCC SLAB
56	KNW-ET	635/1	DGRI-KKN	UP/ DN	635/300-400	635/8-12	17.23*5	Water Way	MAJ	RIVET PG (SEMI THRU)
57	KNW-ET	736/1	DRA-ET	UP/ DN	736/030-042	736/0-2	06.10*2	Water Way	MIN	PSC SLAB
58	KNW-ET	736/2	DRA-ET	UP/ DN	736/328-329	736/8-10	01.22*1	Water Way	MIN	ARCH
59	KNW-ET	736/3	DRA-ET	UP/ DN	736/447-449	736/12-14	01.00*1	Water Way	MIN	BOX CUL
60	KNW-ET	736/3A	DRA-ET	UP/ DN	736/802-803	736/22-24	01.09*1	Water Way	MIN	PIPE (RCC)
61	KNW-ET	737/1	DRA-ET	UP/ DN	737/633-661	737/20-22	08.54*3	Water Way	MAJ	PSC SLAB
62	KNW-ET	737/2	DRA-ET	LN 3	737/963-964	737/30-32	00.61*2	Water Way	MIN	STONE SLAB
63	KNW-ET	738/2	DRA-ET	UP/ DN	738/495-501	738/20-22	02.805*2	Water Way	MIN	BOX CUL
64	KNW-ET	738/3	DRA-ET	UP/ DN	738/696-697	738/26-28	00.91*1	Water Way	MIN	ARCH
65	KNW-ET	739/1A	DRA-ET	UP/ DN	739/148-149	739/6-8	00.67*1	Water Way	MIN	PIPE (RCC)
66	KNW-ET	739/1	DRA-ET	UP/ DN	739/266-293	739/10-12	03.05*2+	Water Way	MAJ	BOX CUL
							03.13*2+			
							3.03*2			
67	KNW-ET	739/2	DRA-ET	UP/ DN	739/410-415	739/14-16	02.385*2	Water Way	MIN	BOX CUL
68	KNW-ET	739/3	DRA-ET	UP/ DN	739/809-810	739/28-30	00.76*1	Water Way	MIN	STONE SLAB
69	KNW-ET	740/1	DRA-ET	LN 3	740/720-723	740/26-28	02.98*1	Water Way	MIN	PSC SLAB
70	KNW-ET	740/2	DRA-ET	UP/ DN	740/917-922	740/32-34	05.35*1	Water Way	MIN	BOX CUL
71	KNW-ET	740/2 III	DRA-ET	Line No. 3	740/917-922	740/32-34	06.10*1	Water Way	MIN	RCC SLAB
72	KNW-ET	741/1	DRA-ET	LN 3	741/988-989	741/32-742/2	00.76*1	Water Way	MIN	STONE SLAB
73	KNW-ET	742/1	DRA-ET	UP/ DN	742/273-276	742/8-10	00.76*4	Water Way	MIN	STONE SLAB
74	KNW-ET	742/2	DRA-ET	UP/ DN	742/500-507	742/16-18	03.66*2	Water Way	MIN	PSC SLAB
75	KNW-ET	742/2 III	DRA-ET	Line No. 3	742/500-507	742/16-18	03.66*2	Water Way	MIN	RCC SLAB

76	KNW-ET	742/3 A	DRA-ET	UP/ DN	742/850-851	742/26-28	01.09*1	Water Way	MIN	PIPE (RCC)
77	TLV-BIR (Spur Line)	RUB at LC No. 189 A	KHA - BIR	SL		599/16-18	04.00*1	RUB	MIN	BOX CUL

NOTE: These details shall be re-verified by the bidder/tenderer before start of work.

1.7 TELECOMMUNICATION INFRASTRUCTURE: The station is provided with the following telecommunication infrastructure:

- 1.7.1 Stations are having a Control Phone, TPC phone and Auto Railway phones.
- 1.7.2 DOT Phones are provided at the station.
- 1.7.3 24-Fibre OFC and 6 Quad Cable is available in the section.
- 1.7.4 Control communication is working on IP-MPLS/STM/MUX equipment.
- 1.7.5 VHF communication is available for Driver, Guard & Station Master communication.

1.8 SALIENT FEATURES OF THE PROJECT REQUIREMENT ARE LISTED BELOW:

- 1.8.1 Survey, design, drawing and documentation for the entire project. All drawings and plans are to be designed and submitted to Railways for approval. Approved SIPs, existing cable route plans and proposed building plans will be provided by the Railway.
- 1.8.2 Provision of Centralized architecture based Electronic Interlocking involving both indoor and outdoor works as per RDSO Spec. No. RDSO/SPN/192/2019 Ver 2.0 or with latest amendment, TAN No. STS/E/TAN/3012 Version 4.0 dated 23.07.2025 and all other latest TAN of RDSO related to EI.
- 1.8.3 Cable laying should be carried out as per extant specifications and RDSO guidelines.
- 1.8.4 Earthing & Surge Protection Devices and associated works to be provided as per RDSO approved Drawing.
- 1.8.5 Civil engineering works for construction of Station Service Buildings at 7 stations as per attached drawings.
- 1.8.6 Electrification of all the 7 No. Service Building of all 7 stations and provision of Air-conditioning in Relay rooms of all the 7 No. Service Buildings.
- 1.8.7 Power Supply will be drawn by provision of AT Supply from existing OHE network and ATs & Auto Changeover of RDSO approved source shall be provided at all the station buildings.
- 1.8.8 Supply, Installation, testing and commissioning of multiple aspect colour light signals as per approved SIP.
- 1.8.9 Installation, testing, and commissioning of telecom gears in the stations. It includes telecom cables, telecom equipment, all control/TPC/DOT etc. phones, all other Telephones, PA system, UTS/PRS, CCTV, VHF etc.
- 1.8.10 **Supply of Spares for Maintenance:** The estimated cost includes supply of essential spares for maintenance of Signalling gears which will be commissioned under this project as per Annexure-VII attached.

SECTION – II: CONSIDERED TECHNICAL REQUIREMENT & POLICY

- 2.1 This project for Provision of Centralized EI in lieu of existing PI as per specifications RDSO/SPN/192/2019 Ver 2.0 with latest amendment, TAN No. STS/E/TAN/3012 Version 4.0 dated 23.07.2025 and all other latest TAN of RDSO related to EI to suit yard layout as per approved Signal Interlocking Plan which will be supplied by Railways. The work is to be carried out as per RE standards. Approved SIPs are placed in Annexure.
- 2.2 The work is to be executed as per provisions of the Indian Railway Signal Engineering Manual (IRSEM) with latest amendments, OEM specifications of the systems & latest guidelines issued by Railway Board, RDSO & WCR-HQ with latest amendments.
- 2.3 SIPs of the stations of the project are provided in the document as a guide to the bidders. Bidders will submit their bid along with a detailed scheme proposed to be implemented.
- 2.4 CRS paper will be prepared & submitted by contractor to Railway and Railway will submit CRS application for CRS sanction for commissioning of EI at all 7 stations.
- 2.5 For commissioning of Dagarkhedi, phase work has to be carried out by the contractor without any additional cost at Barud station (Dagarkhedi side) in connection with commissioning of UFSBI block working and block section axle counter involving alteration in existing PI, CCIP, station drawings, CRS sanction papers and other associated works required till commissioning.
- 2.6 For commissioning of Channera station, phase work has to be carried out by the contractor without any additional cost at Charkheda Khurd station (Channera side) in connection with commissioning of UFSBI block working and block section axle counter involving alteration in existing PI, CCIP, station drawings, CRS sanction papers and other associated works required till commissioning.
- 2.7 For commissioning of Surgaon Banjari station, phase work has to be carried out by the contractor without any additional cost at Charkheda Khurd station (Surgaon Banjari side) in connection with commissioning of UFSBI block working and block section axle counter involving alteration in existing PI, CCIP, station drawings, CRS sanction papers and other associated works required till commissioning.
- 2.8 **Station Service buildings:**
 - 2.8.1 Station service buildings shall be constructed as per typical drawing attached. Construction and Electrification of Service Buildings are covered in the scope of work.
 - 2.8.2 The civil buildings are proposed to be constructed as per the survey reports attached along with bid document. However, re-survey will be done after award of the contract for finalization of exact location and approval of all concerned will be taken before start of work at site.
 - 2.8.3 Any shifting/dismantling work required for constructing new service buildings at stations is also covered under this project.
 - 2.8.4 The survey of the location of the service buildings at the stations has been conducted by the Railways. Proposed building location drawings are uploaded with the details of shifting/dismantling, if required at site. Methodology of the work of construction of service buildings shall generally follow the sequence.
 - a) Clearing the site of construction by shifting of existing utility (any type) or dismantling (as indicated in each station drawing),
 - b) Construction of new rooms (Size and location indicated in drawing).
 - 2.8.5 A total of 7 No. service buildings is to be constructed at seven stations. The building should be constructed with brick masonry and RCC pillars. Pre-fabricated PORTA Huts are not acceptable for this purpose. All items of building works shall conform to specification of works of W.C. Railway. The building work shall include electrical internal wiring including fitting of tube lights, power sockets, switchboards, fans, air conditioners etc. of appropriate capacity as per WCR guidelines and instruction of Authority or its representative.
- 2.9 **Power Supply Arrangement for Station Service Buildings:**
 - 2.6.1 All the service buildings except BIR shall be provided with 2 No. each UP & DN of rating 25 KVA AT Supplies. Provision of Supply and installation of ATs is covered in the scope of the

project. Auto Changeover as per RDSO approved source shall be provided at each service building.

- 2.6.2 CLS panels are to be supplied and installed by the contractor at all the 7 No. station buildings. Capacity of UP and DN ATs shall be of 25 KVA for all the stations except BIR. AT supply is to be drawn from OHE as per ACTM.
- 2.6.3 All the service buildings shall be provided with SMPS based IPS system conforming to RDSO Specification No. RDSO/SPN/165/2023 (Ver. 4.0) amendment 1.0 with latest amendment as per the requirements given in Annexure-IX with 300AH VRLA Battery set.

2.7 Signalling Interlocking Details:

- 2.7.1 The feeding of signal shall be with cutting in relays of QNA1 RDSO approved type and it will not be from more than 2.8 km in double line / multiple line territories from the relay room/ relay hut. However, for single line auto Signalling territory this distance will be 2.1 km.
- 2.7.2 Necessary alterations & modifications in adjacent IBH/LC gate/Station in both indoor and outdoor will be done by the Contractor as per requirement and approved SIP and other drawings of station/IBS/LC gate without any additional cost.
- 2.7.3 Supply, installation, testing and commissioning of all the equipment at station compatible with existing installed systems of BPAC and IBS for making running signalling functional with EI.

SECTION – III: SCOPE OF WORK AS CONSIDERED

- 3.0** Technical requirements (non-exhaustive) for the implementation of the project are given below. However, these are the minimum technical requirements covering only major items which must be adhered to by the contractor. Approval of the Authority or its representative must be taken for the technical requirements of other items required for commissioning of EI at seven stations as per approved scheme. Any deviations from these technical requirements should have prior approval of the Authority or its representative.

3.1 Electronic Interlocking (EI):

- 3.1.1** Supply, Installation, Testing & Commissioning of Centralized Electronic Interlocking equipment's complete as per specification No. RDSO/SPN/192/2019 Ver 2.0 with latest amendment and TAN No. STS/E/TAN/3012 Version 4.0 dated 23.07.2025 with latest amendment and all other latest TAN of RDSO related to EI to suit yard layout as per approved Interlocking Plan which will be supplied by Railways. The tenderer shall calculate the exact requirements of all the I/O bits based on approved SIP, OEM requirement among others before supply of EI items consisting of Central Processing Equipment with centralized Architecture to be supplied from RDSO approved sources only. The EI system shall be provided to operate from the main & standby dual VDU control terminal. EI system shall mainly consists of Central processing unit, interface equipment, Microprocessor equipment, Counters, Counter Box, Inverters as per RDSO TAN, interface relays (QN1, QNA1, QBCA1, QSPA1, QL1, QECX (LED ECR's), 120 seconds Q-series timer relay and any other Relays required for interfacing, inbuilt event logger, inbuilt power supply equipment, EI interconnecting cables, cabinet type dust free racks, (EI rack/Relay rack) as per requirement, indoor cables & Jumper wires, wires, fuses, fixtures, mounting arrangements, Power supply DC-DC converters for various supplies required for EI system, EI tool kit, Housing arrangement, ladder/cable ducts, screwless disconnecting type terminals, FDMS for Main and standby path of OFC etc. along with all accessories necessary to make complete EI system functional. Design of EI system should be compatible as per outdoor interlocking requirement based on tentative approved signal interlocking plan, selection table & locking table and other approved drawings of the station yard.
- 3.1.2** Electronic Interlocking should be done either by an RDSO approved manufacturer or with the supervision, involvement and technical expertise of an RDSO approved manufacturer having a clear authorization for the same.
- 3.1.3** Tenderer may quote any RDSO approved EI system with complete details of all modules, cards, accessories among others along with 10% spares before supply of material. Tenderer has to give full details of quantities before supply of material for commissioning of the proposed RDSO approved EI system. Prior approval of Break-up shall be taken from Railway before supply of material. Station-wise number of working inputs, output and readback bits along with system spare bits are detailed below:

S. No.	Station	Number of bits	Remark
1	Surgaon Banjari	858	NOTE: The EI material for each station shall be supplied based on the number of bits given in the column before or as calculated by the tenderer based on attached Tentative Signalling Plan, whichever is higher. Further, the firm also has to supply 10% spare cards/modules for each station as detailed in Para 3.1.14 below.
2	Charkheda Khurd	444	
3	Chhanera	526	
4	Barud	488	
5	Dagarkheri	491	
6	Itarsi-B cabin	328	
7	Bir	602	

- 3.1.4** The proposed EI shall have provision of required soft relays and protocol for direct interface

with Kavach to facilitate Kavach ready EI installations without requiring design & testing of EI when Kavach is installed later. Provision of Kavach ready Interfaces in Electronic Interlocking is to be provided. Provision of dedicated port with allocation of Kavach bits shall be ensured for Kavach interface as per Railway Board Letter No. 2018/Sig/18/ EI/Gen. New Delhi, dated 04.09.2024 & RDSO Letter No. RDSO-SIG0MISC(GEN)/1/2021Part (1) dated 17.08.2024.

- 3.1.5 Deleted.
- 3.1.6 Redundant communication ports for KAVACH bit allocation should be pre-determined during the Electronic Interlocking design phase, these ports should be tested during SAT and after freezing logic it should be disabled when the Electronic Interlocking is being commissioned and enabled once the stationary KAVACH is installed.
- 3.1.7 KAVACH related information configured on the KAVACH ready EI port should also be made available on the maintenance terminal of EI for diagnostic purposes.
- 3.1.8 The EI system shall be compliant with cyber security standards as per Cyber Security TAN No. EI/TAN/Security ver. 1.0. dated 01.03.2023 with the latest amendment.
- 3.1.9 Supply & installation of 2 No. VDU Operator Console (i.e., VDU 'A' and VDU 'B') with industrial grade embedded fan less PC per station as per RDSO Specification No. RDSO/SPN/192/2019 Ver 2.0 with latest amendment and TAN No. STS/E/TAN/3007 Version 2.0 dated 22.04.2026. The display size of each VDU shall be 55 inch with 4K resolution. Make: Sony/LG/Samsung or equivalent. This also includes supply of one set of input devices (Keyboard & mouse) and power supply arrangement i.e. inverter of gallant Make or equivalent.
- 3.1.10 Supply & installation of 1 No. VDU operator console with industrial grade embedded fanless PC based for Maintenance Terminal per station as per RDSO Specification No. RDSO/SPN/192/2019 Ver 2.0 with latest amendment and TAN No. STS/E/TAN/3007 Version 2.0 dated 22.04.2026. The display size of Maintenance VDU shall be 55 inch with 4K resolution. Make: Sony/LG/Samsung or equivalent. This also includes supply of one set of input devices (Keyboard & mouse) and power supply arrangement i.e. inverter of gallant Make or equivalent. It shall be possible to monitor the live circuit in the maintenance terminal for failure rectification.
- 3.1.11 Suitable housing arrangement/Table for housing of operator's VDU/MT/PC/Switch/Power supply equipment's/Keyboard/Mouse/block instruments and other S&T equipment's as per attached drawing and with the approval of Authority or its representative.
- 3.1.12 Supply and provision of Class A/B/C/D protective devices, surge and lightning protection devices compatible with RE standards as recommended by OEM/RDSO with all the accessories. It includes supply of all the materials which are required to make the complete EI system functional and as recommended by RDSO in Spec. No. RDSO/SPN/192/2019 Ver 2.0 with latest amendments and as per RDSO TAN No. STS/E/TAN/3006 Ver. 3.1 dated 25.06.2025 with the latest amendment.
- 3.1.13 This also includes a comprehensive warranty of complete EI system for a period of two years from the date of commissioning of the EI system.
- 3.1.14 EI equipment includes supply of the following essential spares to the extent of 10% of the quantities supplied (subject to nearest next higher number):
 - Each type of Input/Output cards, processor cards modules and any other module as per EI system requirement.
 - Each type of relay for indoor application.
 - DC-DC converters of all voltages/each type.
 - Any other cards/System/Sub systems which are specific for OEM based EI systems.
 - Switches, connectors, fuses, couplers, patch chords etc. Details to be submitted by OEM in Annexure form before supply of material.
- 3.1.15 This includes minor alterations in the design of the EI system Application logic (up to 30%) free of cost, if required during execution of work/CRS observations/changes in SIP or other drawings i.e., addition/deletion of contacts up to 30%, as desired for safe train operations, as per approved ST/LT as per the same terms & conditions of the contract.
- 3.1.16 EI trouble shooting charts on vinyl boards should be provided inside the EI room. Similarly,

a communication diagram clearly indicating each connection should be made on a vinyl board. BIT charts of appropriate size should be fixed in front of the new/old EI rack.

- 3.1.17 Supply & installation of PC & Laptop based work station (make HP/DELL/IBM/Apple or equivalent) for data input and configuration, simulation and functional testing, diagnostic and troubleshooting & commissioning of EI system. This includes all software with complete FAT testing. FAT set-up includes all required modules /accessories like ethernet cable, hub/switch, connectors or any other item required to perform the FAT testing with A3 colour printer as per Annexure-VIII – **3 No. Set Up**
- 3.1.18 Performing of SAT at station with the installation of Simulation Panel/IO Controller by the agency along with OEM.
- 3.1.19 The contractor has to carry out complete indoor wiring work in the Cable termination rack where outgoing Signalling cables will be terminated with indoor cables and jumper wires.
- 3.1.20 This includes wiring of all indoor equipment i.e. Data loggers, relay rack, CTR, EI, UFSBI, MSDAC, IPS, ELD, AFDAS, FACS etc. The indoor cables and jumpers must be as per RDSO specifications and should be procured from RDSO approved sources.
- 3.1.21 Relays (QN1, QBCA1, AC LED/Conventional ECR, QSPA1, QNA1, QL1, 120 seconds Q-series timer relay & any other relay type or similar as per approved IP and requirement, relay racks, fiber/insulated ladders, Main & standby VDU, operator & maintenance console, DC-DC converters for EI, standard spare items as per OEM of EI recommendations and as per special conditions clause.
- 3.1.22 Supply & installation of Limit switch New Top Roller type with 2 NO + 2 NC contacts Model No. 102TPRA for relay room.
- 3.1.23 Supply of all miscellaneous stores required like Relay racks, Cabinets for equipment housing, trouble-shooting boards, KLCR boxes, Wiring material, indoor cables, fiber/insulated ladders etc. for commissioning of EI.
- 3.1.24 Splicing, Termination, Testing & Commissioning of 24 fiber cable in fiber management system with all installation material, connectors, fittings, etc. as per instructions of site engineer between EI and VDU/MT terminal.
- 3.1.25 Provision of SPD equipment/devices to protect the system from power supply surges/lightning surges and as per RDSO guidelines/specifications.
- 3.1.26 The contractor shall specify the power requirement in terms of voltage and wattage for Electronic Interlocking System.
- 3.1.27 Tenderer shall specify the complete list of items offered under Tool kit. Tenderer shall specifically mention that the list of items given in Tool kit is adequate to install and maintain the electronic interlocking system as per recommendation of the manufacturer. If any other tool is found needed later on during installation it shall be provided by the contractor free of cost.
- 3.1.28 Any other item required to complete and commission the indoor part of EI, as per latest guidelines of railways/RDSO and as per instruction of Authority or its representative.
- 3.1.29 The power and Telecom Cables required from EI/IPS to VDUs and Embedded PCs in Panel room and Maintenance PC room shall be with duplicated cable arrangement. Voltage drop from Power rack to Panel room shall be less than 1 Volt.
- 3.1.30 Supply, Installation, testing and commissioning of crank handle arrangement with Key lock relays (KLCR) working on 24V DC in Panel room as per the approved SIP. KLCR relays shall be AC immunized with configuration to 4F/4B with key and Key ward 'K' Siemens make or similar as per instruction of authority engineer. All other materials/works like KLCR box, pad and locks wiring etc. shall be done by the contractor as per instruction of the authority engineer. Armored indoor/signaling cable to be used for KLCR between Relay room to ASM office and shall be terminated on disconnect terminals in ASM room.
- 3.1.31 110V DC supply shall be derived from IPS for EI system. All the necessary power supplies required for complete functioning of the EI system shall be derived from this. DC-DC Converters, which are recommended by RDSO/OEM, to derive supplies for EI, shall be used.
- 3.1.32 EI shall be wired, installed and commissioned by Competent Engineers of OEM. Pre-commissioning check lists, TSAA and OEM installation certificates as per latest RDSO TAN shall be prepared and signed by an authorized representative of OEM.

- 3.1.33 The Interface and Application logic circuits, VDU layout etc. shall be designed as per the standardization of typical circuits for EI issued by RDSO and as per the WCR Policies.
- 3.1.34 All data files viz. Application Logic, VDU display Logic, Simulation logic, Ports configurations & any other related files used for simulation during FAT/SAT shall be handed over to Division.
- 3.1.35 The Application logic (ALC) shall be submitted only after conducting one round FAT by the OEM (IFAT) and all the documents/certificates related to the IFAT shall be submitted along with the ALC before the start of CFAT. The contractor shall prepare and submit documentation for TSAA and NI readiness for the approval of competent authority.
- 3.1.36 Lettering & Numbering of detail and description writing of particulars of terminations & equipment on relay rack, relays, cable termination rack, fuse alarm system, Block instruments, battery & power equipment's, IPS, operating VDU, axle counter etc. constituting the entire system with contractor's own paint and writing material ("Asian" make or similar enamel paints or similar paint only to be used). This includes supply and fixing of Teflon strips 3mm thick and 25 mm wide for each row of relays and cable terminations. The work shall be done as per extant practice on W.C. Rly & instruction of Rly engineer at site. This also includes writing of CT rack particular on Formica sheet.
- 3.1.37 One set of Instruments and tool kits required for Trouble Shooting and repair of hardware and software for EI systems should be supplied for each station. (This includes tools required for EI maintenance sorts of crimping, insertion, removal, general purpose, tools like screw drivers, spanners, PCB extractors, temp controlled soldering iron, wire cutter, nose pliers etc. & measuring instruments with carrying case/ holders/cabinet for technicians and J.E for testing, maintenance and repair at site) two sets. Each set comprises the following: i) Crimping tools for all types of special cable assembly used in EI systems. ii) Insertion tools for all types of Special cable assembly used in EI systems. iii) Removal tools or all types of Special cable assembly used in EI systems. iv) Digital multimeter (Fluke 111 or better). v) Clamp earth tester. vi) Clamp current meter. **Note:** Any other Tools required for troubleshooting and repair and recommended by OEM shall be supplied by contractor free of cost. **Note:** Tool kit supplied by contractor will have to be certified by OEM that these tools are sufficient for maintenance/Repair/Trouble shooting.
- 3.1.38 CT Racks Particulars (i.e. Function wiring and termination details) may be made using Vinyl Printing or Flex Printing on 300 GSM PVC banner roll of suitable size framed or any other means and shall be fixed on wall through suitable wooden/ metallic frame (CT Board) adjacent to CT rack such that signal staff can view CT rack and CT board details simultaneously.
- 3.1.39 Function identification marker (Ferrules with printed letters/ PVC sleeves with printed details of the cable core / Signalling function in black with yellow background) to be provided on each cable conductor as per Railway board letter No. 2023/Sig/17-Sig Equip/Maintenance/Part dated 06.11.2023
- 3.1.40 Supply of PVC indoor cable 1x60x0.6 mm Dia having colour coding of insulation of inner core shall be six colour viz. Blue, Red, Grey, Green, Brown & Black and shall be confirming to RDSO specification IRS:S 76-89 with latest amendments.
- 3.1.41 Supply of PVC indoor cable 1x40x0.6 mm Dia having colour coding of insulation of inner core shall be four colour viz. Yellow, White, Pink & Violet and shall be confirming to RDSO specification IRS:S 76-89 with latest amendments.
- 3.1.42 Supply of PVC indoor cable 1x24x1 mm Dia having colour coding of insulation of inner core shall be six colour viz. Blue, Red, Grey, Green, Brown & Black and shall be confirming to RDSO specification IRS:S 76-89 with latest amendments.
- 3.1.43 Modification in existing installed EI System of Dulariya (Hitachi make), Khirkiya (Hitachi make) and Talvadiya (Siemens MK-II make) stations as per RDSO Spec. No. RDSO/SPN/192/2019 ver. 2.0 or latest, in connection with the modification of SGE Block instrument with UFSBI Double Line Block Panel. This includes designing Application logic, Interface circuit, VDU diagram, STLT, RSP, floor plan among other relevant drawings. This also includes CFAT testing, alteration in existing relay room, IPS room and VDU room along with supply of all necessary hardware, completion documents among others required for commissioning of UFSBI based block panel.

3.2 Data Loggers:

- 3.2.1 Supply, installation, testing, validation, networking and commissioning of data loggers, modification/augmentation of data base, fault logics as per the technical details given below.
- 3.2.2 Data loggers of adequate capacity (not less than 1024 Digital inputs and 48 Analog inputs, battery, charger, UPS with minimum 06 Hrs. battery backup) as per specification IRS: S 99/2026 Rev 1.0 or latest shall be provided at each station with all accessories.
- 3.2.3 All the materials such as tag blocks, disconnect terminals, cables, wire coils and interface equipment etc. required shall be supplied and installed.
- 3.2.4 Protocol converters suitable to the make of EI shall be supplied and installed for reading the relay statuses directly from EI.
- 3.2.5 After wiring & commissioning, the Data loggers shall have spare capacity of not less than 20% each for both analog and digital inputs separately to cater for future requirements.
- 3.2.6 Installation, wiring, validation, and networking of data loggers shall be carried out by authorized Engineers of OEM. Pre-Commissioning checklists and OEM installation certificates shall be prepared.
- 3.2.7 Potential free contacts of IPS, ELD, SPD, Fire alarm, MSDAC, networking equipment, proximity switch, FACS etc. shall be wired to data loggers and required fault logics shall be implemented to generate alarms and SMS alerts as required.
- 3.2.8 All interface relays should be wired with datalogger.
- 3.2.9 All the Data Loggers shall be networked and integrated with the divisional Data Logger Network.
- 3.2.10 Suitable EI protocol converter and dual port serial to Ethernet converter (or whichever required) to be supplied by contractor at each relay room for interface between EI and data logger and integration between MPLS and data logger network.
- 3.2.11 Networking shall be done on OFC media only.
- 3.2.12 Status of all the systems including redundant systems shall be monitored through Data logger.
- 3.2.13 Exception reports/alarms for any mismatch/failure shall be generated and conveyed to concerned Railway staff and signal control for preventive maintenance and attending failures.
- 3.2.14 Suitable arrangements for earthing of Data logger will have to be provided by the contractor.
- 3.2.15 The validation test of each input shall be carried out after completion of soldering work.
- 3.2.16 The data loggers of all or any of the stations shall be accessible from the central monitoring point through Network Management System.
- 3.2.17 The Network Management System shall be capable of generating exceptional reports for all or any of the stations on a real-time basis and giving alarms.
- 3.2.18 Validation and networking of Datalogger needs to be ensured prior to commissioning. All test operations to be recorded in Datalogger.
- 3.2.19 EI's clock and Datalogger clock through CMU must be synchronized.
- 3.2.20 Closing of doors of Relay rooms shall be monitored through data-logger.
- 3.2.21 OEM to ensure validation of all inputs with the authority engineer and completion of PCCL before commissioning.
- 3.2.22 Data Logger maintenance terminals shall be provided in the maintainer room for day-to-day maintenance of S&T assets as well as quick troubleshooting of failures. It should have all necessary software & drivers for this purpose.
- 3.2.23 Datalogger maintenance terminal specification: **As per Annexure-VI.**
- 3.2.24 All software shall be supplied and installed to have online & offline simulation and relay status of the station in the maintainer room.

3.3 Block working by using UFSBI:

- 3.3.1 Supply, installation and commissioning of Block Proving by Axle Counter [BPAC] using Block panel and UFSBI for Double line Operation as per Spec No. IRS: S-105/2025 [Ver 1.0] with latest amendment. Each set consists of the following: (i) Universal Fail-Safe Block Interface (UFSBI) complete with all accessories as per Spec No. IRS:S-104/2012 [Ver. 0] with

latest version and Amdt. Qty - 02 No. (ii) Block Panel complete with all accessories as per RDSO Drg No. RDSO/S/32017 for double line (latest Amdt.) - 02 No. (iii) Relay rack with due locking and sealing arrangement as per RDSO Drg No. RDSO/S/32018 including all relays and wiring as per wiring diagram as per RDSO Drg No. RDSO/S/32018. Or Electronics Block logic modules (EBLM) type DESBPACBLM V2 with 5 relays as- BIPR1, BIPR2, TGTR, TCFR, & ASCR – 04 No. (iv) Block Telephone with accessories as per RDSO Spec. No. RDSO/SPN/191/2005, (v) RS232 to Fiber Converter for operating UFSBI equipment as per IRS Spec. No. IRS:S-104/2012 Ver. 0 with latest amendment on dark fiber. (vi) Automatic media changeover along with modem and VF transformer working on redundant channels for data transmission on OFC/Quad as per IRS Spec. No. IRS:S-104/2012 Ver. 0 with latest amendment. This is also to be supplied, installed and commissioned at existing adjacent stations i.e. Talvadiya, Khirkiya and Dulariya for block working as per site requirement.

3.3.2 Supply, Installation Testing and Commissioning of Block Proving by Digital Axle Counter (BPAC) using UFSBI for Single line operation as per RDSO Spec. No. IRS:S-105/2025 [Ver 1.0] with latest amendment comprises auto change over facility for quad and OFC working. Necessary modem for quad and OFC should be supplied along with auto changeover arrangement details are as follows. (i) Universal Fail-Safe Block Interface (UFSBI) with complete accessories as per RDSO Spec. No. IRS:S-104/2012 (ii) Block Panel complete with all accessories as per RDSO Drg No. RDSO:S-32019 for single line (latest amendment) (iii) Relay rack with locking and sealing arrangement duly wired as per RDSO Drg No. RDSO: S: 32020 along with complete relays. (iv) Block telephone with accessories as per RDSO/SPN/191/2005 with latest amendment. (v) Automatic media changeover along with additional modem and VF transformer as per manufactures specification for BPAC using UFSBI for supply of above items. Single line block working will be between BIR-SURGAON BANJARI and BIR-TLAVADIYA. This is also to be supplied, installed and commissioned at existing adjacent stations i.e. Talvadiya for block working as per site requirement.

3.3.3 Supply, Installation, Testing & Commissioning of Dual Redundant Arrangement of UFSBI Electronics for exchange of vital relay state exchange pertaining to IB signalling, etc. The system comprises following Sub-systems: a) Supply, Installation, Testing & Commissioning of Electronics for UFSBI interface as per IRS:S-104/2012 Ver. 0 (latest amendment). b) Supply of prewired powder coated MS Cabinet at least 42 U for housing UFSBI electronic modules, relay racks, SPD modules, 4 No. of QN1 (8F/8B) relays per pair & 8 No. QNN1 twin coil relay base etc. c) Supply of RS232 to Fiber Converter for operating UFSBI equipment as per IRS Spec. No. IRS:S-104/2012 Ver. 0 with latest amendment on dark fiber. d) Supply of Automatic media changeover working on redundant channels for data transmission on OFC/Quad as per IRS Spec. No. IRS:S-104/2012 Ver.0 with latest amendment. UFSBI for IB signalling should be compatible with the existing IBS system of adjacent stations. This to be catered only for stations covered under this work for provision of new EI for IBS working as per approved SIP. The existing installed system at IBS is to be utilized and no new UFSBI is to be installed at IBS location. The work also includes trenching, laying, patching and jointing of IBS cables between new relay room/OFC room and existing rooms with contractors' own material like all types of cables, jointing kits among other accessories as per site condition.

3.4 DC Track Circuits at Stations:

3.4.1 Supply, installation, testing and commissioning of Low Maintenance Lead Acid (LMLA) Secondary Cells 2V/ 80AH as per Spec. No. IRS:S 88/2004 with latest amendments.

3.4.2 Installation & charging of 2V 80AH lead acid batteries with contractor's own battery grade sulphuric acid and distilled water with minimum 2 charge-discharge cycle, installation of charged batteries in groups and their connection and wiring. The work shall be done as per extant practice of W.C. Rly and instructions of the Engineer in charge. Detailed measurements of initial charging shall be recorded jointly by the contractor and Railway Site in-charge. This also includes battery transportation from charging place to site.

3.4.3 Supply, installation, testing and commissioning of Track Feed Battery Chargers (TFBCs) of

10A rating to Spec. No. IRS:S-89/2025 Ver 2.0 with latest amendment. The charger shall be suitable for charging 80 AH batteries.

- 3.4.4 Supply, installation, testing and commissioning of Track Lead Junction Boxes (TLJBs) with two vertical angles as per Drg. Nos. JBP/S7T/C/106/I and Drg. Nos. JBP/S7T/C/106/II made from fiber glass along with terminal blocks. The TLJB should be BLACK in colour.
- 3.4.5 Erection, Fitting and Rail connection of Track Lead Junction Boxes with contractor's fixing material and jacketed wire rope including 7mm single groove galvanized channel pin for track lead connection including angle of size 40 x 40 x 5 mm 1200mm length. This will include drilling of holes in rails for track lead connections as per instructions of Rly engineer at site. PVC jacketed galvanized steel wire ropes of 6 mm Dia (7 x 19 strands) sheathed with PVC of 2mm wall thickness and overall thickness of 10mm for connection between the TLJB and the rails are to be used and to be supplied by the contractor. PVC sheath should be made of type 6 compound as per IS5831 of 1970. Double wire ropes are to be connected between each rail and TLJB.
- 3.4.6 Painting two coats of enamel paint over one coat of Red Oxide primer on the following items after scrapping and cleaning of the surface wherever necessary. Primer and Paints both Asian paints/ Berger / Shalimar are to be supplied by Contractor. The work shall be done as per instructions of Rly engineer at site and extant practice on WCR. Track Lead Junction Box (TLJB) (Black enamel outside only).
- 3.4.7 Provision of bonding with contractor's materials including 7mm single groove galvanized channel pin. This will include drilling of 7.2 mm Dia holes in rails (4 No.) and provision of two jumpers for each bond, clipping of bonds etc. with contractors' own materials and tools as per instruction of Rly engineer at site GI wires of 4mm Dia (8 SWG) are to be used for jumpers across fish plates which should be supplied by the contractor free of cost.
- 3.4.8 Supply, installation, testing and commissioning of B-Type Choke to RDSO Spec. No. IRS:S 65/83 with latest amendments.
- 3.4.9 Supply, installation, testing and commissioning of adjustable Track Feed Resistance, 30 ohms as per RDSO Drg. No. SA-20161-66M/M with latest amendments (with Phenolic moulded base).
- 3.4.10 Supply, installation, testing and commissioning of Hydrometer, Exide make or similar for measuring specific gravity of Battery Graded acid with mounting stand in location Boxes.
- 3.4.11 Supply, installation, testing and commissioning of QBAT Track Relay (AC immunized relay), 9 Ohm, 2F/2B, along with plug board (Base plate), retaining clips and connectors as per RDSO/SPN/84 Ver 2.0 with latest amendments. Supply and Installation of Location Boxes and associated works.
- 3.4.12 Supply, installation, testing and commissioning of Track Relay QTA2 (AC immunized relay), 9 Ohm, 2F/1B along with plug board (Base plate), retaining clips and connectors conforming to BRS:939A & 966 Appendix F2, IRS:S-34 & IRS:S-23 with latest amendments.

3.5 Single Section Digital Axle Counters (SSDAC):

- 3.5.1 Supply, installation, wiring, testing and commissioning of SSDAC with Dual detection as per RDSO Specification No. RDSO/SPN/177/2012 (Ver. 3.0) and latest amendment and as per RDSO TAN No. STS/E/TAN/7010 Ver. 1.0 dated 20.11.2024 with the latest amendment along with all associated works as per approved signalling plan. This is to be supplied, installed and commissioned at Surgaon Banjari, Charkheda Khurd, Channera, Barud, Dagarkheri, ET-B and BIR stations and existing adjacent stations i.e. Talvadiya, Khirkiya and Dulariya also for block working as per approved SIP and site requirement.
- 3.5.2 Supply, installation, testing and commissioning of Digital Axle Counter, Single Section type with dual detection to cater for 4 detection points monitoring 3 track sections suitable for working with straight and continuous track section on straight line and suitable for IBS application and compatible with existing installed ELDYNE make axle counter. This item shall include supply of final track clearance relay, track side electronics, deflector plates, housing for track side electronics etc. This should include supply of LV boxes and reset boxes

etc. of the system. The axle counter system should be supplied as per RDSO/SPN/177/2012 Ver. 3 with the latest amendment. This is to be supplied, installed and commissioned only at Sargaon Banjari, Charkheda Khurd, Channera, Barud, Dagarkheri stations for IBS working as per approved SIP and site requirement.

- 3.5.3 Supply, Installation wiring, testing and commissioning of earthing of track device as per OEM requirement and RDSO specification.
- 3.5.4 The resetting provision for Digital Axle Counters shall be as per the approved design. It should have both auto reset & manual reset through SM VDUs. All resets shall be of preparatory type only.

3.6 Multi Section Digital Axle Counters (MSDAC):

- 3.6.1 The work for provision of Frauscher Make MSDAC in parallel with DC track circuit is under execution by Bhopal division/Open line unit at 6 stations i.e. Dagarkheri, Barud, Channera, Charkhera Khurd, Sargaon Banjari and Itarsi-B. Out of which, complete yard will be covered under this ongoing work at Channera and Itarsi-B and only main lines will be covered at remaining 4 stations i.e. Dagarkheri, Barud, Charkhera Khurd and Sargaon Banjari. The work to be carried out by the firm under this EPC contract is detailed in following paras.
- 3.6.2 Supply, Installation, wiring, testing and commissioning of complete MSDAC (both indoor and outdoor including cabling i.e. complete in all aspect) in parallel with DC track circuit as per RDSO Specification RDSO/SPN/176/2013 (Ver. 3.0 or latest) along with all associated works for the remaining portion (Loop lines and sidings) of tracks compatible with existing planned MSDAC (Frauscher make) at 4 stations i.e. Dagarkheri, Barud, Charkhera Khurd & Sargaon Banjari as per approved SIP for EI work. This also includes shifting, wiring and installation of existing Central Evaluators in the new relay room and wiring from CT rack to Central Evaluator, Shifting and installation of the reset box, LV box and all other associated MSDAC material at all 4 stations and work required to make the system functional with the existing system and to integrate with EI is in the scope of the project. Separate track clearance relay shall be picked up for each main and redundant track section. The work also includes trenching, laying, patching and jointing of MSDAC cables between new relay room/OFC room and existing rooms with contractors' own material like all types of cables, jointing kits among other accessories as per site condition. This also includes supply of 1 No. Diagnostic PC as per Annexure-VI attached for every station.
- 3.6.3 Shifting, wiring and installation of existing Central Evaluators in the new relay room and wiring from CT rack to Central Evaluator, Shifting and installation of the reset box, LV box and all other associated MSDAC material at the remaining 2 stations i.e. Channera and Itarsi-B and work required to make the system functional with the existing system and to integrate with EI is in the scope of the project. Separate track clearance relay shall be picked up for each main and redundant track section. The work also includes trenching, laying, patching and jointing of MSDAC cables between new relay room/OFC room and existing rooms with contractors' own material like all types of cables, jointing kits among other accessories as per site condition.
- 3.6.4 Supply, Installation, wiring, testing and commissioning of MSDAC in parallel with DC track circuit (Complete indoor and outdoor installation) at BIR station as per approved SIP in the entire yard. This includes supply of Tools Kit for Digital Axle Counter Multi section type: Service test panel including meter for test of track equipment, tools for mounting and adjustment of track equipment, standard jig for drilling holes in rail among others. It should be as per Principal manufacturers (OEM) recommended list adequate for installation, day to day maintenance and adjustment of indoor and outdoor gears.
- 3.6.5 Supply, Installation wiring, testing and commissioning of earthing of track device as per OEM requirement and RDSO specification.
- 3.6.6 Installation of track device (double rail contact of digital axle counter) includes digging of trench, track crossing, laying of Double walled ant rodent corrugated pipe from track device to location box / mushroom / EJB and making its terminations. Fixing of deflector plates. (Double walled ant rodent corrugated pipe made up of High-Density Polyethylene of required

Dia and all other accessories as per site requirement to be supplied by the firm). Casting of foundation for track side housing & erection of track side housing. Installation & wiring of EJB/Track side electronics inside the track side housing including supply of wires and other accessories as per site requirement. It also includes Modification/Shifting of existing track devices as per site requirement.

- 3.6.7 Interface between Evaluator to each DP will require ½ quad or one Quad connectivity as per OEM specific RDSO approved scheme at contractor's cost. The actual requirement is to be specified by the bidder as per OEM.
- 3.6.8 Supply, Installation, fixing, Wiring, Testing & commissioning of MSDAC Indication/Alarm panel system.
- 3.6.9 Line wise quad cable shall be laid for MSDAC DPs in the station yard.
- 3.6.10 MSDAC work shall be executed as per Dual detection policy of WCR-HQ issued vide letter No. WCR/N-HQ/110/Sig-Policy-corres./Sig-32 dated 06.04.2026 or latest.

3.7 Automatic Fire Detection & Alarm System (AFDAS) at stations:

- 3.7.1 Supply, installation, testing and commissioning of Automatic Fire Detection & Alarm System (AFDAS) as per RDSO/SPN/217/2025 Ver 3.1 or latest including aspirating type smoke detectors, Linear Heat detection system, heat and smoke multi sensors, control panel, manual call points and other associated accessories.
- 3.7.2 The panel shall be capable of operating on 240 volts AC power supply, automatic battery charger, 24 volts, sealed lead acid maintenance free batteries sufficient for 24 hours normal working and then be capable of operating the system for 30 minutes during emergency conditions as per detailed specifications complete as required.
- 3.7.3 Panel, Auto Telephone Dialer (GSM), Analogue Addressable Multi-Sensor Detector with multiple sensitivity (adjustable at site) levels, programmable for timed automatic sensitivity selection with base, and other accessories shall be supplied & installed.
- 3.7.4 Smoke detectors shall be placed over every rack, equipment on the roof of the relay room, IPS room, OFC room, ASM/Panel room, Duty room etc. In the battery room it shall be placed on the roof as per the battery placement formation at every 1.5-meter space. It shall also be placed in every section of the SM/Panel cabinet so that all the wiring is covered. It is also to be provided in the existing OFC room at BIR station.
- 3.7.5 The Linear heat detector cables shall be placed at every cable/wire tray and shall be placed in zig-zag format with one loop completing in 0.5 meter of tray length. (illustration: sinusoidal form with one wavelength of 0.5 meter)
- 3.7.6 Output Module which will provide potential free (NO/NC) contact, Hooter cum Strobe, isolator devices for every 20 detectors and Auto Telephone Dialer (GSM).
- 3.7.7 Aspirating type Smoke Detection System Air Sampling Type detector shall use LASER type. This type of detector shall use a piping or tubing distribution network that shall run from the detector to the area to be protected.
- 3.7.8 Detailed design of AFDAS duly showing the layout and wiring diagram of all heat and smoke multi-sensors, aspiration type system, LHS cable etc. shall be submitted for approval of authority engineer.
- 3.7.9 All other materials/works like cable duct, casing & camping. Interface cables and any miscellaneous materials required for complete functioning of AFDAS as per RDSO specification are in the scope of the project.
- 3.7.10 Spares shall be provided as per RDSO/SPN/217/2025 Ver. 3.1 with the latest amendment.

3.8 Fuse Auto Changeover System (FACS) at stations:

- 3.8.1 Supply, wiring, testing and commissioning of Fuse auto changeover system for use in Railway signalling system as per RDSO/SPN/209/2012 Ver 2.0 with latest amendment.
- 3.8.2 Enough Type-I (Automatic changeover unit 32 nos. of external Non-Deteriorating Type or G type fuses from 0.6 Amp to 4 Amp) & Type-II (automatic changeover unit 24 nos. of external Non-Deteriorating Type or G type fuses from 4 Amp to 10 Amp) shall be supplied & installed

in such a way that all the fuses used in the relay room are covered under Fuse Auto Changeover System. Number of fuses & its rating shall be derived from the approved circuit diagrams.

- 3.8.3 Potential free contacts of the remote sensor / alarm unit of the Fuse Automatic Changeover unit shall be wired to the data logger.
- 3.8.4 Fault logics of datalogger shall be suitably modified to generate SMS alerts of Fuse blown up cases.
- 3.8.5 All fuses as per the approved circuits and as per the guidelines given in the contracts shall be incorporated with Fuse Auto Changeover System.
- 3.8.6 FACS system shall be installed in either IPS room or duty room as per instruction of Authority or its representative.

3.9. Earth Leakage Detection (ELD) and Earth Fault Localization System (EFLS):

- 3.9.1 Earth Leakage Detectors (ELDs) as per RDSO/SPN/256/2025 Ver. 2.0 or latest shall be supplied and installed in the IPS room. Level-3 ELD shall be provided along with the Earth Fault Localization system. The ELD shall have the feature of live monitoring & displaying of insulation resistance of connected cables.
- 3.9.2 The basic detector unit shall comprise 12 channels or as per standard.
- 3.9.3 It should be deployed to monitor all indoor & outdoor signalling/6 Quad/telecom cables. The contractor shall furnish the details & functional diagram for the approval of the authority engineer before supply. It shall cover the details such as requirement of DC/AC bus bars etc.
- 3.9.4 Separate ELDs shall be supplied & installed for different groups of cables.
- 3.9.5 If the detector is required for a smaller number of channels, dummy plates shall be provided.
- 3.9.6 Two different earths shall be connected to ELD (one may be from ring earth provided for EI).
- 3.9.7 Earth Leakage Detectors shall be provided at each station. The cables of either side of the station should be connected to different channels.
- 3.9.8 Pre commissioning checklist and OEM installation certificate shall be prepared and submitted. All the power cables shall be in healthy condition as per earth leakage detector set values.
- 3.9.9 Potential free contacts of Earth Leakage Detector shall be wired to data loggers.

3.10 Power Supply arrangements at stations:

- 3.10.1 Supply, installation, testing and commissioning of SMPS (Major) based IPS system suitable for 4 lines/6 lines station in RE area along with VRLA battery set of cells 2V/300AH along with spares and tools as per RDSO specification No. RDSO/SPN/165/2023 Ver. 4.0 with the latest amendment. For connecting IPS to battery bank, 10 meter each of Red and Black colour Power cable of size as per battery 2V/300AH capacity, 12 core x 1.5 Sq. mm. signalling cable for connecting IPS to Status Monitoring Panel is to be supplied by the contractor. The firm will supply one additional SMR of rating 110V, 20A in addition to SMRs supplied with SMPS under this item. IPS shall be supplied as per Annexure-IX attached.
- 3.10.2 All supplies shall be wired right from IPS to power supply distribution board / rack. The wiring shall be done with single core multistrand flexible copper wire of 10 Sq mm, 16 Sq mm, 25 sq mm etc. as per IS:694 of 1990 or latest as per RDSO recommendation of IPS installation. This also includes installation of CT rack in IPS Room, fixing of ARA/ Wago terminals with connections suitable for 32A. The 25 sq mm wire shall be used for connecting Batteries from IPS, 16 sq. mm power cable is to be used for wiring of 110V DC, 110V AC & 60V DC (internal) and for balance power supply 10 sq. mm power cable is to be used. All connectors, wiring material, ladders, DWC pipes etc. as per site requirement are to be arranged by contractor as per instructions of railway engineer at site. This also includes supply, fixing and wiring of one exhaust fan in the IPS room.
- 3.10.3 Supply of flexible cable single core multistrand copper conductors, 1x10sq. mm confirming the RDSO specification IRS:S 76-89 with latest amendments.
- 3.10.4 Supply of flexible cable single core multistrand copper conductors, 1x16sq. mm confirming the RDSO specification IRS:S 76-89 with latest amendments.
- 3.10.5 Supply of Insulation MAT for Electrical purpose 2.5 mm thick, size 2m x 1m suitable for 3.3

KV to 11KV (Class B) conforming to IS:15652-2006 in IPS room, Power distribution rack, Relay rack etc.

3.11 Earthing & Surge Protection Devices and associated works at stations:

- 3.11.1 Supply and installation of Perimetric/Ring earth (Maintenance Free Earth) arrangement as per RDSO Spec. No. RDSO/SPN/197/2016 Version 1.0 or latest. This also includes supply of all required materials along with Maintenance free earthing items as per latest RDSO Guidelines for commissioning of Perimetric earth covering the entire building. Earthing shall comply with all guidelines specified in RDSO TAN No. STS/E/TAN/3006 version 3.1 dated 25.06.2025 or latest.
- 3.11.2 Supply of earth electrode assembly as per Drg. No. 19-D6 of IRSEM.
- 3.11.3 Installation & fixing of earth electrode assembly as per Drg. No. 19-D6 including earth wire connected through GI wire 8 SWG supported on M.S. flat of size 6mm x 40mm to earth electrode for signaling Equipment such as apparatus cases, signals, relay racks, block instruments etc. as per RE manual. The earth value should be less than 10 ohms including the lead wire. It should be documented and painted on an earth enclosure made of concrete. The contractor will bring Earth enclosures and all other material required for provision of earthing.
- 3.11.4 Providing earth Electrode and earthing connections in the Rocky area with mechanized drilling of 6-inch (150mm) Dia hole, 3 meter deep. All other items for installation of earth electrode assembly shall be followed as per WCR Drg. No. S&T/CON/KOTA/EARTHING/01 ALT - 01 and connecting through stainless steel wire 8 SWG supported on M.S. flat of size 5mm x 40mm to earth electrode as per Drg. No. T/2014/1 for signals and T 2014/5 for location boxes. The earth value should be less than 10 Ohms including the lead wire. The value should be measured in the presence of Rly. Supervisors. It should be documented and painted on an earth enclosure made of concrete. All other material required for provision of earthing will be brought by the contractor. The contractor will bring Earth enclosures and all other material required for provision of earthing.
- 3.11.5 Supply and installation of class A type lightning arrestor with necessary maintenance free earthing arrangement with all required material like Veeder counter, earth power cable, isolator ISG, mast, class A equipment, maintenance free earthing among others as per RDSO TAN No. STS/E/TAN/3006 version 3.1 dated 25.06.2025 or latest. Minimum 2 No. of Class A has to be provided at every station along with 4 No. maintenance free earths in ring form for each Class A i.e. total 8 No. maintenance free earths.
- 3.11.6 Supply and installation of MOVs and other earthing related equipment in all the signalling and telecommunication circuits as per WCR-HQ letter No. WCR/N-HQ/110/Sig Policy/Sig-32/Pt-X dated 20.03.2026 with the latest amendment.

3.12 Level Crossing (LC) Gates:

- 3.12.1 Replacement of Signalling Gears at manned interlocked level crossing gates within the station section as per approved SIP. Existing, Electrically Operated Lifting Barriers and emergency sliding booms along with road signals, relay wiring, power supply arrangement and other associated infrastructure shall be replaced with contractor's own material.
- 3.12.2 Supply, installation, wiring, testing and commissioning of Electric Lifting Barrier (without hand generator), Sliding boom, Road Signals, Gate Operation Panel, Sliding barrier, Power Supply, KLCR, Gate Gombi's, Hooter, Magneto Telephone (Dual) facilities etc. and all necessary arrangements as per WCR extant Policies of interlocking of LC gates for commissioning of the EI work and as per approved drawings. EOLB shall be as per RDSO specification RDSO/SPN/208/2012 Ver. 2.0 Amdt. 1 or latest.
- 3.12.3 The booms (both EOLB & SLB) shall be so installed that its bottom is about 800 mm to 1000 mm from Road level. The minimum distance from the center of nearest track to boom shall be as per IRPWM.
- 3.12.4 Retro reflective tape of yellow shall be provided on the EOLB & SLB.

- 3.12.5 Separate rack(s)/location boxes shall be used for interlocking LC gates at yard. The interlocking circuits of LC thus, shall be completely segregated.

3.13 Survey, Design, Drawing and Documentation work at stations:

- 3.13.1 Supply of documents, one set consists of 6 sets of following drawings per station: (i) Manual for installation, testing, Commissioning and maintenance of the system (ii) Functioning and system overview (higher management level) (iii) Completion documents as per extant practice of WCR. (iv) Design and supply of circuits and plans to suit layout given in the signalling plan for hot standby arch. Electronic Interlocking system. All plans and wiring diagrams shall be prepared on AutoCAD drawing and supplied with CD. This will include supply of RSP, ST/LT, Control cum indication panel/VDU diagram, square sheet, wiring diagram (Application logic and interface circuit), Fuse analysis, contact analysis, Tag Block Analysis, EI earthing diagram, power supply distribution / Power equipment arrangement (with program switch), auto changeover diagram (if required) and all other relevant drawings. Soft copy of all documents in CD/DVD or pen drive will also have to be submitted by the contractor. These documents are also to be supplied for adjacent stations i.e. Talvadiya, Khirkiya and Dulariya having alteration due to change in block working.
- 3.13.2 Preparation & submission of integrated cable route plan (telecom cable in the station area) of main & tail cables along with track crossing, cable courage plan, location particulars, CT rack particulars, meggering report, earth resistance particulars, traction bonding diagram and any other drawing / particular required in Auto CAD in A3 size. Each sheet should have a block for signature of Railway Officials as well as block for signature of the firm, where signature shall be put up by the authorized signatory of the firm. The name of the work as given by the Railways shall be written on every sheet under the WORK column. The contractor shall initially supply 2 Sets of circuits duly signed by the circuit designer having substantial experience on design side for making such circuits, complete for approval of Railways. Railway will return one set of circuits to the contractor duly approved with alterations/ corrections, if any. The contractor shall incorporate Railway's alterations/corrections in the original tracings & CD without any deviation and submit two copies of the modified circuits. Original tracings so modified & final CD complete in all respects along with 4 sets of final approved circuits (out of which one set shall be supplied in transparent polythene bags. Only two sheets of circuits shall be placed in one polythene bag/cover each) shall be submitted to the Railways in case there is no further alteration suggested by Railways.
- 3.13.3 Design and supply of Detailed Signalling Circuits including panel diagram (if required), SWR & TWR, SWRD, Control table, Route section plan, Selection Table, Fuse & Negative Tag Analysis, Contact Analysis, Relay Rack Arrangement and wire count sheet etc. in A3 size, Completion circuit shall be plotted in AutoCAD. The contractor shall initially supply 2 Sets of circuits duly signed by the circuit designer having substantial experience on design side for making such circuits, complete for approval of Railways. Railway will return one set of circuits to the contractor duly approved with alterations/ corrections, if any. The contractor shall incorporate Railway's alterations/corrections in the original tracings & CD without any deviation and submit two copies of the modified circuits. Original tracings so modified & final CD complete in all respects along with 4 sets of final approved circuits (out of which one set shall be supplied in transparent polythene bags. Only two sheets of circuits shall be placed in one polythene bag/cover each) shall be submitted to the Railways in case there is no further alteration suggested by Railways. These documents are also to be supplied for adjacent stations i.e. Talvadiya, Khirkiya and Dulariya having alteration due to change in block working.
- 3.13.4 Supply, Fabrication & screen printing of SWRD/Laminated board/System information board/failure information board on white Formica of 1200x600x3mm as per instruction of site engineer. Proportionate payment will be made if the size of the board gets increased or decreased.

3.14 Laying of Signaling & Telecom Cables:

- 3.14.1 Supply and laying of Signaling & Telecom cables required for commissioning of station along with alterations of IBH, is covered under the scope of this project.
- 3.14.2 Cable laying shall be carried out as per Railway board letter No. 2022/GS/IR/Cable laying policy dated 29.03.2023 and as per provisions and drawings as given in latest available Signal Engineering Manual & Telecom manual. In case of any deviation, prior approval of Authority engineer or its representative shall be taken by the tenderer before start of work.
- 3.14.3 Detailed Cable route plan, Cable Core Plan, Cable testing reports, Track Bonding plan, DP plan among other indoor and outdoor drawings shall be prepared and submitted by the tenderer for approval of the Authority Engineer.
- 3.14.4 Proposed Cable route survey shall be conducted by the tenderer jointly with Railways and to be submitted for Railway approval by the tenderer.
- 3.14.5 Cable cut of existing signaling and telecom cables must be avoided in any case failing which penalty will be imposed by authority as per extant guidelines in this regard.
- 3.14.6 Meggering of all Cables before and after its laying before termination by contractor under supervision of authority engineer and submitting the cable meggering register. If the insulation resistance of the cable observed after refilling of the cable trench is found below permissible limit, the said cable must be replaced or repaired by the contractor at his own cost.
- 3.14.7 Four (4) No. of 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for every crossover point. Two (2) No. of 12 core x 1.5 sq. mm signalling cable shall be laid as tail cable for every Turnout/Point machine. In addition to this, 2 No. of 12 core x 1.5 sq. mm signalling cable shall be additionally laid as main cable for emergency crossover point at every station having distance more than 1 KM from Relay room.
- 3.14.8 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for main signal and route signal AC lighting circuit and another 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for main signal and route signal DC circuit. Similarly, separate 12 core x 1.5 sq. mm signalling cable shall be laid as tail cable for main signal and route signal respectively for AC lighting circuit. Additionally, Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid for starter, advance starter and home signal only for future ABS work apart from the above.
- 3.14.9 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for subsidiary signals AC lighting circuit and another 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for subsidiary signals DC circuit. Similarly, separate 12 core x 1.5 sq. mm signalling cable shall be laid as tail cable for different types of subsidiary signals for AC lighting circuit.
- 3.14.10 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as main Bus bar cable for B24/N24 feeder for TPR via every location containing TPR circuit at both sides of station relay room.
- 3.14.11 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as main Ring Bus bar cable for B24/N24 feeder for TPR at last location only containing TPR circuit at both sides of station relay room.
- 3.14.12 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as main Bus bar cable for BX110/NX110 for Track Feed Battery Charger input supply via every location containing TF circuit at both sides of station relay room.
- 3.14.13 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as main Ring Bus bar cable for BX110/NX110 for Track Feed Battery Charger input supply at last location containing TF circuit at both sides of station relay room.
- 3.14.14 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as main Bus bar cable for BX110/NX110 for location lighting via every location at both sides of the station relay room.
- 3.14.15 12 core x 1.5 sq. mm signalling cable shall be laid as main cable for controlling of various other signalling gears like TPR among others.
- 3.14.16 12 core x 1.5 sq. mm signalling cable shall be laid as tail cable for TF & TR circuits from location box to TLJB.
- 3.14.17 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as dedicated SPARE cable via every location up to calling on location at both sides of the station relay room.

- 3.14.18 Two (2) No. 12 core x 1.5 sq. mm signalling cable shall be laid as dedicated SPARE cable directly at the last location of the station at both sides of the station relay room.
- 3.14.19 Separate 12 core x 1.5 sq. mm signalling cable shall be laid for Line verification (LV) box of MSDAC.
- 3.14.20 Line wise 0.9mm Dia, 6 Quad cables shall be laid for SSDAC/MSDAC in the station yard as per OEM practice (i.e. $\frac{1}{2}$ or Full quad per DP) and as per latest RDSO TAN for installation of SSDAC/MSDAC system.
- 3.14.21 Adequate spare conductors to a minimum of 20% of the total conductors used shall be provided for each main signalling and quad cable up to the outermost point in the station and 10% spare beyond the outermost point. If this criterion for spare conductors is not fulfilled then extra cable has to be laid for providing additional spare conductors. The spare conductors shall be provided on the outermost layer.
- 3.14.22 All cables shall be properly earthed duly soldering its armor and connecting by tinned copper wire from earth rod to cable armors.
- 3.14.23 Cable markers shall be provided all along the route at a nominal interval of 50 m. Additional markers shall be provided to indicate important points like cable joints, water and sewage mains, power cable, crossings, alignment bends/curves, etc. The Quad cable RCC route marker shall be as per provisions and drawings as given in Signal Engineering Manual (APPENDIX–II Chapter 15) for signaling cables and Indian Railway Telecom Manual for telecom cables. The route markers shall be installed immediately after cable laying and before closing of the trench for accuracy.
- 3.14.24 The existing cable route plan has been uploaded on IREPS. Before starting the trenching work in Section, cross trenching shall be done by the contractor at the interval of every 50 meter in the station section and at every 200 meter in block section to identify the existing cable in section in order to protect the existing cable in section and yard area from cable cut. Sufficient number of Cable route/fault locators with latest technology shall be made available at site during trenching and survey work to avoid cable cuts.
- 3.14.25 JCB should not be used in the station section for trenching and other related work, other means of trenching as per scope of work shall be adopted for trenching in the station section. JCB may be used in the Block section, if feasible, under supervision and prior approval of the authority engineer. Manual trenching or other means of trenching as per scope of work may also be required in the block section, if JCB cannot be used.
- 3.14.26 Excavation of trench as per cable route plan, 1.2 mtr deep, 300mm wide at the bottom along main line in normal soil, This work includes covering of cable laid in trenches by loose soil for a layer of 50 mm thickness approximately before covering by Shahabad stone/bricks, clearing of route, bushes etc. and refilling of the trench by excavated soil and ramming after laying of the required quantity of cables as per instructions of Engineer at site. Excavation of trench as per cable route plan, 1 mtr deep, 300mm wide at the bottom along main line in hard soil / murum, This work includes covering of cable laid in trenches by loose soil for a layer of 50 mm thickness approximately before covering by Shahabad stone/bricks, clearing of route, bushes etc. and refilling of the trench by excavated soil and ramming after laying of the required quantity of cables as per instructions of Engineer at site. Excavation of cable trench 1m deep and 300mm wide across the track, for track crossing and refilling after laying of GI pipes.
- 3.14.27 Cutting of all types of platforms, trenching & excavation to depth of 300 mm x 300mm wide approx. and refilling after lying of GI pipes and repairing the platform to restore to original condition.
- 3.14.28 Cutting of all types of Roads preparatory to trenching & excavation to depth of 1 Mtr X 300 mm wide approximately and refilling, after laying of GI pipe and to restore the road to original condition.
- 3.14.29 Works pertaining to Horizontal Directional Drilling (HDD)/boring and trenchless cabling: It includes supply, transportation and insertion of self-lubricated HDPE pipe and laying of cable in boring under the track/road/platform/ circulating area by using different sizes of pipes depending on the total number of cables will be crossed. This item will be used for track crossing of running line, road crossing and circulating area, track crossing among others as

per site requirement. By using a self-lubricated HDPE pipe of 120mm outer Dia and 103.5 mm inner Dia in the bore and laying of cable in the bore under the track/road/ circulating area. HDD work shall be carried out as per Bhopal division JPO No. BPL/N/Sig/Misc/56/HDD dated 15.02.2026 or latest.

- 3.14.30 Laying of GI/DWC/RCC pipes along with collars in trenches at places wherever required as per the instruction of the engineer at site.
- 3.14.31 Supply and fixing of GI pipe of 100 mm Dia and 3.65mm thickness at culvert & bridges followed by masonry work at the edges of the cable. Blowing and drawing of OFC through an already buried HDPE duct taking due care while transporting and sealing both the ends after blowing. The cable should be blown according to the technical instructions of the manufacturer and the instructions of the site in-charge.
- 3.14.32 Laying of HDPE pipe as per approved cable route plan in the excavated trench, taking due care while transporting and laying the same in the trenches or other protective works. Both the ends of the duct should be sealed with end plugs before laying and should remain sealed till blowing is done.
- 3.14.33 The route of existing cable must be traced and mapped and marked with Chuna & Khuti marking before start of the HDD boring/JCB digging or any kind of excavation work. The contractor or his/her representative shall be present at the time of marking the route of the existing as well as new cable to be laid.
- 3.14.34 Preparation of cable duct 150mm x300mm deep for laying of cable in rocky area and refilling the duct (after cable laying) with concrete mixture of proportion 1:3:6 and grouting the ends at either side of the rocky portion using concrete mixture with contractor's own cement and other materials.
- 3.14.35 Supply & laying of well burnt/fly ash bricks of size 225x100x75mm inside the trench (with the brick length being perpendicular to cable route) after laying of cables in station area from Home-to-Outermost signal or at any other location as per instruction of Site Engineer.
Note: -Size of bricks to be approved by Site Engineer.
- 3.14.36 Physical tracing and opening/locating of existing working cables by precession digging for diversion of cables in connection with cable clearance for S&T works without interfering the circuits as per the advice of Railway site engineer.
- 3.14.37 Patching work in existing locations consists (i) Digging of pits, cleaning of earth from all sides, breaking of seal of location boxes, removal of sand from location, marking of new cable hole. (ii) Insertion of cable from ground. (iii) making place for cable termination in old location, shifting of ARA, fuse etc. after removal of termination including shifting of ARA. (iv) Termination of cable in old location. (v) Sand filling and plastering.
- 3.14.38 All cable entry points at station building, Relay room, Auto hut, apparatus cases, junction boxes etc. must be closed by the contractor with suitable masonry works with all contractor's material and pits must be covered with sand, closed with concrete slabs and plastered to avoid entry of snakes/rats/water.
- 3.14.39 Before taking any excavation work in the vicinity of existing cables, the existing cables must be identified with cable route tracer, and the existing cable route is to be identified and marked with white powder to avoid its damage during excavation work. All these activities must be carried out by the Contractor in coordination with the authority engineer & Open line of Division.
- 3.14.40 Supply & fixing of Polyolefin cable channel of size width 240/340 mm, height 155/230 internal /external, length 1 meter produced of polyolefin with fire protection class K-1 in accordance with DIN 53438 Part-II for laying signaling/telecom cables in yard area from Home Signal to Home Signal. This is to be strictly laid as per railway board policy letter No. 2022/GS/IR/Cable laying policy dated 29.03.2023.

3.15 Signals:

- 3.15.1 Supply, Installation, Wiring and Commissioning of FRP type Colour Light Signals with all necessary materials and accessories ensuring full functionality as per the Approved Station Interlocking Plan (SIP).

- 3.15.2 It shall include Signal Unit, Surface Base, Ladder and, Ladder Shoe, Offset Brackets, Junction / Stencil Type Route Indicators, U-Bolts and Nuts, Arrow Marker (for Right-Hand Side signals), Universal Lock, Number Plates, C/A/G Marker Plates, Pinnacles, Calling ON Signal Unit, Shunt Signal Unit, All Types of LED Aspects as per the approved SIP, A/AG Markers (LED lit type), All Type of Markers / Indicators shown in the SIP, Screens on Signals, front staging.
- 3.15.3 Enameled/Retro-Reflective Signal number plates shall be provided. It should be white background (for other than gate stop signal) with black letters as shown in Drg No. 19-D10 (sheet 3). For the Gate stop signal, the background shall be yellow.
- 3.15.4 The position of foundations of signal posts, Location boxes, warning boards, etc. as required, will be indicated and jointly signed between Authority's representative and Contractor at site before commencement of the work.
- 3.15.5 The excavation of pits for various types of foundations shall be done as per approved drawings given by the Authority's representative.
- 3.15.6 During the excavation, the loose soil of the pit shall be thrown on plain ground away from track and left out earth, if any, shall be thrown outside the railway premises.
- 3.15.7 Strengthening of signal foundation shall be done for all those signals whose foundation is not surrounded by rammed earth on all four sides for at least 40 cms width. Signal posts shall be filled with river sand to prevent entry of rodents.
- 3.15.8 The complete signal unit, along with all its accessories such as ladder, stage, ladder shoe, signal hood, etc., shall be erected at site, ensuring adherence to all safety precautions and compliance with the Indian Railway Schedule of Dimensions (IRSOD).
- 3.15.9 LED signal housing made of FRP as per RDSO/SPN/194/2006, Rev.2.0 or latest., prewiring for LED signals, terminal strips, reflective strips on rear side, ventilation and pole mounting attachment. Fabrication, supply and fixing of Red, Yellow, Green, Route, Calling On, A, AG marker etc. and retro reflective markers, padlocks, associated works etc.
- 3.15.10 Color light signal post tubular steel 140 mm Dia as per IRS 56/81, Four/Three/Two aspect Color light signal units confirmed to IP-54, Direction type route indicators, offset bracket for color light signal.
- 3.15.11 Provision of Signals along with associated accessories at station and in sections shall be as per approved Signal Interlocking Plan (SIP). Wherever required, signals in the yards and sections to be provided with offset brackets for better visibility.
- 3.15.12 A cross mark on new signals shall be provided at the time of erection and shall be removed at the time of commissioning.
- 3.15.13 The complete signal shall be painted with two coats of Enamel / Aluminum paint after preparing the surfaces smooth by emery paper polishing. The signal infringement distance shall be painted on the signal surface base towards the track side. The paints shall be of Berger / Asian / British / JSW etc.
- 3.15.14 Signal post height shall be 3.6 meters or higher as per site conditions to achieve the required visibility.
- 3.15.15 A cable loop pit of size not less than 1 mtr depth and 1.5 mtrs diameter shall be made near every signal and a loop of 6 to 8 mtrs of each cable shall be coiled and kept in the pit. Individual cable coils shall be tied with released cable pieces and kept in the pit on top of the other, if multiple cables are to be terminated in the same signal. The loop pit shall be refilled and rammed. In any case the depth of the topmost cable shall not be less than 1 mtr. The tail cables shall be taken through the foundation, signal post and terminated in the signal unit as per WCR Policies.
- 3.15.16 For the colour light signals in the RE area that fall within 2 meters from live conductor screening arrangement shall be provided and separately earthed. The screen shall be made of MS wire mesh and fixed on MS angles of size 25 mm x 25 mm x 6 mm with suitable fixing clamps, bolts, and nuts. It shall be painted with one coat of red oxide and two coats of black paint of Berger / Asian / British / JSW, etc. make.
- 3.15.17 All Route Indicators shall be mounted on the top of the signal post firmly. The tail cables for route indicators shall be taken through signal post without any damage to the insulation and armor, skinned and terminated on route indicators. Hoods shall be fixed properly and

examined during day time and if required extension of hoods shall be made to have proper visibility.

- 3.15.18 Calling-on signals/ P marker/ IB marker/ Shunt signals shall be fitted on the signal posts at required height using suitable offset brackets.
- 3.15.19 In Case of signals with horizontal clearance less than 2.36 mtrs from the nearest track center, blanking arrangement shall be provided as per IRSOD. The ladder of the signal shall be blanked off to a height of 300 mm between 2060 mm and 2360 mm above rail level using MS plate not less than 8 mm thickness. The end portions of the plate shall be rounded off, and no sharp edges shall be protruding. The plate shall be painted with two coats of black colour. The signal post shall be painted as per Annexure 19-A1 of IRSEM. The paints shall be Berger/ Asian/ British/ JSW make.
- 3.15.20 All the cable conductors shall be provided with printed ferrules indicating the function they are working, as per RB Lr. No. 2023/Sig/17-SigEquip/Maintenance/Part Dt: 06.11.2023.
- 3.15.21 Distance from the track center should be painted on the signal base.
- 3.15.22 All the necessary markers to be provided to identify the signal such as 'G', 'P', 'D', 'ID', 'IB'.
- 3.15.23 The height of the signal post shall be adjusted as per the decision of the Authority Engineer regarding height of signals shall be final and binding on the Contractor and the length of the post shall be cut if required by Authority Engineer.
- 3.15.24 A ladder shall be fitted to the signal post. The ladder base shall be fixed with GI base in the ground and legs shall be embedded in concrete to be supplied by Contractor.
- 3.15.25 All the old Signals must be dismantled and removed from site to store for disposal.

3.16 Apparatus Cases/Location Boxes:

- 3.16.1 Supply, transportation, casting, foundation, installation, termination of cables, wiring with all accessories and necessary materials, testing of wiring and fixtures in location boxes and signals with all accessories and necessary materials required for commissioning of the system.
- 3.16.2 Only new Location Boxes shall be utilized for housing S&T equipment for commissioning of stations.
- 3.16.3 Supply and Installation of Steel Apparatus Case (Single case and Half case) with miniature 'E' type locks with keys (1 key per 5 location boxes) as per Spec. No. IRS:S 30 & RDSO Drg. No. SA 3376/M & 3377/M as per requirement.
- 3.16.4 The apparatus cases shall be installed as per cable core plan by Excavation of Pit, Casting foundation as per standard Drawing. The top surface of the foundation shall normally be at rail level in a plain area.
- 3.16.5 For all location box foundations strengthening of foundation with stone pitching shall be done up to a height of 40 cm covering an area of one meter around the Location box foundation. The foundation shall be lime washed with two coats after completion of erection of location box.
- 3.16.6 The apparatus case shall be painted with one coat of primer after preparing the surfaces smooth by emery paper polishing. The apparatus case shall be painted with two coats of aluminum paint on the outer surface and two coats of white paint inside. The paints shall be of Berger / Asian / British / JSW etc.
- 3.16.7 Supply & fixing of 12 mm hylum sheet for cable termination inside location box. Supply and fixing of 2 in 2 out Wago terminal for termination of all types of cables, supply and fixing of Fuse blocks and fuses along with ARA for positive and negative supply, wire coils, relays, earthing and earth connections. Cable termination, relay, and other particulars of location boxes shall be painted on the inner side of the location box door.
- 3.16.8 The apparatus case in which any equipment like SSDAC, MSDAC, DCDP, Track Charger etc. needs to be kept shall be provided with hylum sheet of 18mm thickness covering entire area of the location box.
- 3.16.9 The apparatus case in which any relays are to be fixed shall be provided and fitted with a powder coated relay fixing frame made of MS angle 25 mm x 25 mm x 3 mm. The frame shall be painted with two coats of paint. A gap shall be maintained after every two relays to facilitate ease of maintenance.

- 3.16.10 A cable loop pit of size not less than 1 mtr depth and 1.5 mtr diameter shall be made near every location box and a loop of 7 to 10 mtr of each cable shall be coiled and kept in the pit. Individual cable coils shall be tied with released cable pieces and kept in the pit on top of the other, if multiple cables are to be terminated in the same location box. The loop pit shall be refilled and rammed. In any case the depth of the top most cable shall not be less than 1 mtr.
- 3.16.11 Excavation and Casting of location box foundation, Installation of location box, filling of location foundations with river bed sand and plastering on top of the sand.
- 3.16.12 The floor surface should be plastered and polished with cement in all apparatus cases / junction boxes by the contractor using his own material.
- 3.16.13 Lettering/Numbering/ferrules of Termination particulars, equipment names etc., legibly and neatly inside location boxes as per as per Railway board policy No. 2023/Sig/17-Sig Equip/Maintenance/Part dated 06.11.2023.
- 3.16.14 The cable termination Details of Location Box (Location Termination Particulars) shall be prepared in AutoCAD/ any suitable software.
- 3.16.15 Cable termination documents/Plans shall be submitted to railway before the start of the cable laying work for approval.
- 3.16.16 Location Box, inside & outside should be painted with red oxide first & then by aluminum paint.
- 3.16.17 Outdoor cables shall be generally kept tied and dressed at the backside of the terminal board, supported on suitable string rod, which shall be supplied by Contractor.
- 3.16.18 All the cable armor must be connected to earth with soldering and clamps.
- 3.16.19 For alteration work the new cable must be inserted from the bottom of the foundation or designated pipes/duct in the foundation.
- 3.16.20 All the old Location boxes must be dismantled and removed from site to store or for disposal.

3.17 Telecom Works:

- 3.17.1 Supply and laying of 24 fiber OFC with HDPE duct, 6 quad cable and 20 pair PIJF cable from relay room to telecom room, SM room to telecom room and Relay room to SM room as per requirement. Supply and installation of FDMS for 24 Fiber OFC cable termination.
- 3.17.2 The existing 24/48F OFC, quad cable etc. of the block section shall be cut and patched to the new OFC room at a suitable location doing proper termination, joints etc. The patching shall be at the location as decided by the site engineer. Termination of OFC and 6 Quad cables as per instruction of site Engineer. The work also includes trenching, laying, patching and jointing of all types of cables between new OFC room and existing OFC room with contractors' own material like all types of cables, jointing kits among other accessories as per site condition.
- 3.17.3 All the Interface Termination of Relay Room, Panel room, MT room and any other etc., shall be terminated in the Cable Termination Rack with Hylam sheet with 2 in 2 out Wago Terminals, end plate, steel carrier Din rail and end stop as per RDSO/SPN/189/2004 with latest amendment.
- 3.17.4 Supply and installation of maintenance free earth for telecom equipment at all stations. Separate earth to be provided for VHF at all stations.
- 3.17.5 Supply and installation of VHF based secured communication equipment consisting of micro controller-based equipment with built in voice/Data/ storage facilities 25 W VHF Radio with talking instrument, power supply (12V DC/15 Amp) sealed maintenance free battery bank 12V/120AH, Omni Regular directional stacked dipole antenna. 50 mtr length RG-217 cable. Including portable programming and data backup Terminal, as per RDSO specification no RDSO/SPN/TC/73/2008 with latest amendments at all stations.
- 3.17.6 Supply and installation of control telephone and auto phones.
- 3.17.7 Supply and installation of Multi Telephone Way station control Equipment (MTWE) for control communication as per RDSO Spec. No. RDSO/SPN/TC/66/2007 Ver 1.0 with latest amendment with necessary mounting arrangement on composite rack or on wall as decided by site engineer
- 3.17.8 Supply and installation of 42 U rack in OFC room.

- 3.17.9 Supply and installation of Maple 4C and 108 Mbps TDM over Ethernet Multiplexer with provision of four DTEE1 channels (ECAT) for connectivity of UFSBI, BPAC as per site requirement.
- 3.17.10 Supply and installation of CAT 6 UTP cable, 8-port POE Networking switch with 2 port SFP fully loaded, 24 port L2 Manageable Switch, OFC patching cord, CAT-6 Patch cord, CAT6 I/O face plate back box & 9U rack as per instruction of site in-charge.
- 3.17.11 Supply and installation of 10/100 Mbps single model Media converter fiber to Ethernet as per site requirement.
- 3.17.12 Laying & fixing of PVC casing-caping or conduit pipe size 25 mm on wall structure etc. Using suitable fasteners, this includes laying of CAT6 and other telecom cable into the installed casing caping/conduit pipes for UTS/PRS and PA system etc. All the necessary material such as switches, cables, Wago, Krone terminations, CTBs, etc. required for this is in the scope of the work.
- 3.17.13 Supply and laying of GI pipe 100 mm and DWC pipe as per site requirement.
- 3.17.14 Excavation of the trench and track crossing as per site requirement.
- 3.17.15 Placing & securing of concrete cable route markers in trenches at the specified interval and at diversion joints etc. along the cable route.
- 3.17.16 Apart from above, the work also includes shifting of all the existing telecom equipment including IPMPLS, battery set, battery charger among others from Old OFC room to new OFC room at all the stations except at BIR station is covered under this work and the work is to be executed as per instruction of Authority engineer.

3.18 Miscellaneous Works:

- 3.18.1 Replacement of Point Machine (IRS/TWS) in case of point machine failure. Point machine and ground connection will be supplied by Railways.
- 3.18.2 Removing of old cable connection and termination of new cable connection in point machine. This also includes replacement of S bend pipe and tail cables, internal wiring of point machine, Correspondence adjustments and testing of point machine.
- 3.18.3 Painting two coats of enamel paint over one coat of Red Oxide primer on a Point machine with ground connection complete after scrapping and cleaning of the surface wherever necessary. Primer and Paints both Asian paints / Berger / Shalimar are to be supplied by Contractor. The work shall be done as per instructions of Rly engineer at site and extant practice on W.C Rly.
- 3.18.4 Lettering numbering of signals, point machines, Track Lead Junction Boxes, Apparatus Cases etc.
- 3.18.5 Necessary technical documents, installation & maintenance manuals, troubleshooting procedure details and any other required technical information shall be provided, and one set for each station.
- 3.18.6 Dismantling of Concrete foundations/Demolishing RCC/CC/Stone Work /Cutting Tar/ CC Flooring/Pre-cast Concrete slabs/Brick work etc. Including leading the debris inside the Railway limit or outside the Railway limit as directed by the Engineer in charge.
- 3.18.7 Releasing of all equipment of Relay room/ Axle Counter room/ IPS room/ Battery room / ASM room/ ESM duty room / Data Logger room, covering the entire indoor signaling gears as per site requirement. It also includes releasing of entire outdoor signaling gears in connection with signals, track circuits, LC gates, etc. complete including location boxes, equipment inside the location boxes including the breaking & removing of foundation which are obstructing Track/ Pathway as per the instruction of Railway Engineer at site & their transportation to SSE/Sig/C/Store/BPL. The contractor must release all old equipment as per instruction of the Railway Site Engineer.
- 3.18.8 Provision of temporary Gumti of 3Mtr x 3Mtr x 2.5Mtr on hire for Pre NI and NI working made of water proof tent (Covered on three sides of wall) with provision of good quality tarpaulin mat laid inside full floor area of Tent, two tables two chairs, Water dispenser with 5 mineral water bottle refills of 20 ltr each and two incandescent lamps/ Emergency Light as per instructions of Railway Engineer at Site. The number of gumties to be provided at each station will be decided by authority or its representative.

- 3.18.9 Equipment layout, relay positioning, cable terminations, fuse positioning and wiring shall be identical in all location boxes and CT rack throughout the project. Cartridge fuse, non-deteriorating type low voltage cartridge fuse and PPTC fuse shall be used as per requirement. Wiring shall be designed to improve reliability by paralleling contacts wherever spare relay contacts are available.
- 3.18.10 All the flexible wires shall be terminated using suitable sized lugs. These lugs shall be crimped and soldered. Wire identification Ferrules of insulation material shall be provided at both ends of the wire with terminal particulars printed on it. No writing work where ferrule is used for cable identification.
- 3.18.11 Supply and erection of fencing panel for cover EI earthing at all stations.
- 3.18.12 During Pre-NI/NI periods, large/adequate no. of additional technical staff as per specific instructions of engineer in charge including wiremen, black-smith, skilled technicians, supervisors, labour, etc. will be needed for testing & commissioning of outdoor signaling gears.
- 3.18.13 Training of Sr. Engineers/ Jr. Engineers / Technicians/ on Installation, Testing, Commissioning, Maintenance, Repair and trouble shooting. (one unit = 4 man/day) Total 82 Nos.
- 3.18.14 Supply and installation of fire extinguisher having Supply of fire extinguisher having Composite/SS/Aluminum Cylinder of same fire rating as per latest BIS: 15683:2018 and as per specific service pressure requirement for use. Fire Extinguisher CO2 type 4.5kg shall be provided in every Relay, IPS, OFC, Panel room & new service building (Minimum 8 Nos. at each station).
- 3.18.15 Supply and installation of Block Section Limit Board (BSLB), stop board and goods warning board as per approved signal interlocking plan of all 7 stations.
- 3.18.16 Supply of Rubber Mat of 5 mm thickness near CLS panel and IPS.
- 3.18.17 Supply and Insertion of glued joints and liners in the yard as per site requirement and approved SIP.
- 3.18.18 Supply & Provision of TRD bonds in track circuit area as per approved Track Bonding plan.

3.19 Furniture, PCs & Printers:

- 3.19.1 Supply of Revolving Chair (4 at each station).
- 3.19.2 Supply of visitor chairs (8 at each station).
- 3.19.3 Supply of Almirah Steel shelving cabinets (4 at each station).
- 3.19.4 Supply of Side Rack/Sliding door file storage (2 at each station).
- 3.19.5 Supply of Table size length 1800mm width 900mm height 760mm (2 at each station).

Item	Panel Room	ESM Duty Room	Relay Room	OFC Room	Model No.
Revolving Chairs	1	1	1	1	Model GODREJ BRAVO MID BACK or similar
Visitor chairs	2	2	2	2	Model GODREJ MODEL 1018 or similar.
Almirahs	2	1	0	1	GODREJ INTERIO STEEL ALMIRAH 1855 mm 4 SHELVES (GODREJ INTERIO)
Side Tables/Racks	1	1	0	0	Side Rack/Sliding door file storage Model GODREJ VSDU 10 WITH WOODEN TOP or similar
Tables	0	1	1	0	Godrej/Lifestyle/Stella or similar

3.20 Supply of Material & its Inspection:

- 3.20.1 All materials required for completion of the project as per the scope for full functionality of the all the signalling and telecommunication system conforming to the Feasibility Report, RFP and EPC Agreement documents duly conducting the RDSO/RITES/Consignee Inspections, shall be supplied by the contractor.
- 3.20.2 Supply of materials shall align with the Project milestones specified in the EPC Agreement. The contractor shall submit a detailed plan for supply of materials for the approval of authority. There should not be a case of over supply or under supply of materials.
- 3.20.3 The contractor shall submit a request seeking an inspection call letter from the Railway.
- 3.20.4 Prior approval of all the materials with make/brand, specification, data sheet, inspecting agencies etc. shall be taken from Authority Engineer before procurement. It is advised that the contractor should put up the list of all materials along with such details to the Authority Engineer within 30 days of award of the contract to avoid any delay in project progress.
- 3.20.5 Supply of sample materials shall be arranged by contractor if Authority Engineer asks for the same before finalization of any materials.
- 3.20.6 All the critical items as defined in the RDSO letter No. 2022/RS(G)/779/8 dated 26.09.2025 or latest shall be inspected by RDSO only.**
- 3.20.7 The cost of the inspection done by RDSO will be borne by Railway in accordance with RDSO's letter No. STS/INS/Policy dated 16/19.08.2002. All the inspection charges other than RDSO shall be borne by the contractor.
- 3.20.8 Normally, the inspecting agency shall not be changed. However, in case the nominated inspecting agency is not in a position to carry out inspection due to policy changes / or any other reason, the inspection shall be carried out as per Authority's decision on the request of the contractor with proper justification.
- 3.20.9 For the inspection to be done by the Authority's Engineer all the necessary arrangements such as facilities/tools/arrangements/manpower etc. shall be made by the Contractor.
- 3.20.10 For the items having RDSO specifications and for which RDSO approved sources are available for procurement, the material shall be purchased from the RDSO approved sources only. Any relaxation with respect to procurement / inspection shall be with the prior approval of the Authority.
- 3.20.11 The Contractor will be required to furnish manufacturers/suppliers Guarantee Certificate and performance guarantee test reports, if any. Any defects noted during this period will have to be rectified by him promptly at his own cost. The Contractor must also furnish proof of purchase / dispatch from the manufacturer/Seller.
- 3.20.12 Authority Engineer will have powers to reject the Material, if that is not in accordance with the contract or owing to the adoption of any unsatisfactory method of manufacture.
- 3.20.13 Material, irrespective of value, which is not in conformity with the specifications, loss, defective or damaged, will be rejected summarily.
- 3.20.14 Loading, unloading and transportation of all materials with all lead and lift from one location to other is in the scope of the project.
- 3.20.15 Contractor shall adhere to all safety instructions, circulars and norms issued by Railway when working close to track to ensure safety of trains as well as staff working in the vicinity of the track. The contractor shall deploy adequate look out men while working on track with all necessary safety devices, tools and gadgets.
- 3.20.16 Site order register, technical register, Site work Registers and daily progress register etc. shall be maintained by contractor for keeping various records of the work being executed by contractor, the instructions given to him vis-vis complied and the decision taken/deficiency pointed out during inspections by various officials.
- 3.20.17 In case of change of specification/description/drawing, the materials with the latest/ modified specification/ description/drawing shall be accepted. If the materials with specifications/description/drawing are not available in the market, then the decision of the Authority shall be final.

Section-IV Civil and Electrical works

4.1 Civil Works (Station buildings):

- 4.1.1 S&T service buildings (including all electrical fitting & wiring) shall be constructed at places mentioned in the table below. This will involve General Lighting supply, provision of AC in the Relay room and AT supply from CLS panel to the newly constructed rooms with suitable protection fuse/MCB.
- 4.1.2 The building should be constructed of brick masonry and RCC pillars. Prefabricated PORTA Huts are not acceptable for this purpose. All items of building works shall conform to specification of works of W.C. Railway.

Table-A: Requirement of S&T Service building at 7 stations in ET-KNW section of Bhopal Division, WCR				
S. No.	Station Section	Station	Number of Service building	Remark
1	ET-KNW	Surgaon Banjari	1 No.	Surgaon Banjari Charkheda Khurd & Barud station building at high level.
2	ET-KNW	Charkheda Khurd	1 No.	
3	ET-KNW	Chhanera	1 No.	
4	ET-KNW	Barud	1 No.	
5	ET-KNW	Dagarkheri	1 No.	
6	ET-KNW	Itarsi-B cabin	1 No.	
7	SGBJ-BIR	BIR	1 No.	
Total			07 No.	

4.2 BUILDING REQUIREMENTS - S&T Service building:

- Opening of exhaust fans in IPS & Battery room to be made during construction itself along with lintel protection and anti-theft arrangements.
- Cable duct size (450mmx600mm) with concrete slab cover shall be provided in the equipment room.
- Earth terminals connected with reinforcement at plinth level should be properly earthed.
- Height of the structure from floor level to roof level should be a minimum 3.5 meters.
- The level of the building should be kept at least 1200 mm above rail level. This level shall be kept in view of the highest flood level (HFL) in Section.
- A false ceiling is not recommended.
- Flooring should be finished with Vitrified tiles and Battery rooms to be provided with Acid proof tiles

4.3 Civil work Requirements:

- The building work shall include sanitary fittings, sewerage system, water supply arrangement and internal fittings, approach roads, and other works incidental to buildings.
- Building works shall be deemed to include service buildings, buildings required for installation of equipment for signaling, telecommunication and electrification work.
- Providing and laying in position M 25 Grade concrete for reinforced concrete structural elements as per direction of Engineer in charge.
- Foundations, footings, bases of columns, etc. for mass concrete.

5. Supplying Reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level- Thermo-Mechanically Treated bars of grade Fe-500D or more.
6. Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth, 1.5m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth, lead up to 50m and for all lift for all kind of soil as directed by Engineer-in-Charge.
7. Providing and applying plaster of Paris putty of 2mm average thickness over the plastered surface to prepare the surface even and smooth complete.
8. Steel work welded in built up sections/ framed work including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.
9. Providing and fixing fly proof galvanized M.S. wire gauge to windows and clerestory windows using galvanized M.S. wire gauge with average width of aperture 1.4mm in both directions with wire of Dia 0. 5mm.
10. Finishing walls with Acrylic Smooth exterior paint with Silicone additives of required shade on new work (Two or more coats applied @ 1.67ltr/10 sqm over and including one coat of water proofing cement paint applied @ 2.20 kg/10sqm.
11. Finishing walls with Acrylic Smooth Interior paint of required shade on new work (Two or more coats applied @ 1.67 ltr/10 sqm over and including base coat of water proofing cement paint applied @ 2.20 kg/10 sqm.
12. Providing and fixing float glass panes with putty and nails including removal of old broken panes wherever required.
13. Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colors, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete. Providing and fixing 10 mm thick acid and/or alkali resistant tiles of approved make and colour using acid and/or alkali resisting mortar bedding, and joints filled with acid and/or alkali resisting cement as perish: 4457, complete as per the direction of Engineer-in- Charge.
14. Providing and fixing 18 mm thick gang saw cut, mirror polished, pre-moulded and pre-polished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, molding and polishing to edges to give high gloss finish etc. complete at all levels. Area of slab up to 0.50 sqm.
15. Providing and fixing aluminum sliding door bolts ISI marked anodized (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour or shade with nuts and screws etc. complete, Painting with synthetic enamel paint of approved brand and manufacture to give an even shade.
16. Providing and fixing to IS: 2202 Part-1 marked flush door shutter decorative type, core of block board construction with frame of 1st class hard wood and well-matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces. 35mm thick including ISI marked stainless steel butt hinges with necessary screws.
17. Providing and fixing factory made P.V.C. door frame of size 50x47 mm with a wall thickness of 5 mm, made out of extruded 5mm rigid PVC foam sheet, mitered at corners and joined with 2 Nos of 150 mm long brackets of 15x15 mm M.S. square tube, the vertical door frame profiles to be reinforced with 19x19 mm M.S. square tube of 19 gauge, EPDM rubber gasket weather seal to be provided throughout the frame. The door frame to be fixed to the wall using M.S. screws of 65/100 mm size, complete as per manufacturer's specification and direction of Engineer-in-Charge.
18. Providing and fixing factory-made panel PVC door shutter consisting of frame made out of M.S. tubes of 19-gauge thickness and size of 19 mm x 19 mm for styles and 15x15 mm for

top & bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture. M.S. frame covered with 5 mm thick heat moulded PVC 'C' channel of size 30 mm thickness, 70 mm width out of which 50 mm shall be flat and 20 mm shall be tapered in 45 degree angle on both side forming styles and 5 mm thick, 95 mm wide PVC sheet out of which 75 mm shall be flat and 20 mm shall be tapered in 45 degree on the inner side to form top and bottom rail and 115 mm wide PVC sheet out of which 75 mm shall be flat and 20 mm shall be tapered on both sides to form lock rail. Top, bottom and lock rails shall be provided on both sides of the panel. 10 mm (5 mm x 2) thick, 20 mm wide cross PVC sheet be provided as gap insert for top rail & bottom rail, paneling of 5 mm thick both side PVC sheet to be fitted in the M.S. frame welded/ sealed to the styles & rails with 7 mm (5 mm+2 mm) thick x 15 mm wide PVC sheet beading on inner side, and joined together with solvent cement adhesive. An additional 5 mm thick PVC strip of 20 mm width is to be stuck on the interior side of the 'C' Channel using PVC solvent adhesive etc. complete as per direction of Engineer-in-charge, manufacturer's specification & drawing.

19. Providing and fixing M.S. Tubular frames for doors, windows, ventilators and cupboard with rectangular/ L-Type sections, made of 1.60 mm thick M.S. Sheet, joints mitered, welded and grinded finish, with profiles of required size, including fixing of necessary butt hinges and screws and applying a priming coat of approved steel primer.
20. Providing and fixing paneling or paneling and glazing in paneled or paneled and glazed shutters for doors, windows and clerestory windows (Area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Paneling for paneled or paneled and glazed shutters 25 mm to 40 mm thick.
21. Providing and fixing aluminum sliding door bolts ISI marked anodized (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour or shade with nuts and screws etc. complete: 250 x10 mm
22. Providing and fixing fly proof stainless steel grade 304 wire gauge, to windows and clerestory windows using wire gauge with average width of aperture 1.4 mm in both directions with wire of dia. 0.50 mm all complete.
23. Providing and fixing aluminum extruded section body tubular type universal hydraulic door closer (having brand logo with, IS: 3564, embossed on the body, door weight up to 36 kg to 80 kg and door width from 701 mm to 1000 mm), with double speed adjustment with necessary accessories and screws etc. complete.
24. Providing and fixing circular/ Hexagonal cast iron or M.S. sheet box for ceiling fan clamp, of internal dia 140 mm, 73 mm height, top lid of 1.5 mm thick M.S. sheet with its top surface hacked for proper bonding, top lid shall be screwed into the cast iron/ M.S. sheet box by means of 3.3 mm dia round headed screws, one lock at the corners. The clamp shall be made of 12 mm Dia M.S. bar bent to shape as per standard drawing.
25. Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).
26. Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colors and shades, laid on 20 mm thick cement mortar 1:4 (1 cement : 4 coarse sand) jointing with grey cement slurry @ 3.3 kg/sqm including grouting the joints with white cement and matching pigments etc., complete as per requirement.
27. Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colors such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement :4 Coarse sand), jointing with grey cement slurry @ 3.3 kg/sqm including pointing the joints with white cement and matching pigment etc., complete as per

requirement.

28. Providing and fixing Heat Resistant Terrace Tiles (300 mm x 300 mm x 20 mm) with SRI (solar refractive index) > 78, solar reflection >0.70 and initial emittance >0.75 on waterproof and sloped surface of terrace, laid on 20 mm thick cement sand mortar in the ratio of 1:4 (1 cement : 4 coarse sand) and grouting the joints with mix of white cement & marble powder in ratio of 1:1, including rubbing and polishing of the surface up to 3 cuts complete, including providing skirting up to 150 mm height along the parapet walls in the same manner.
29. Any part of work which is not to the required standards & specifications in the opinion of the authority or its representative shall be rejected and the contractor shall make good such rejected works.
30. The tenderer should visit the site of work and get himself acquainted with the site conditions, approach the site, density of railway traffic, available clearances, space for working for the work. The location of site and scope of work, including brief description, has been enclosed with the tender. The tenderer must read it carefully to get a fair idea of the work involved.
31. While excavating the foundation, the contractor shall ensure that no damage is caused to underground sewer line pipes, cables etc. He should also ensure the stability of the adjoining lines, road buildings etc. damage to any of the underground services or any adjoining structures if caused during work shall be fully made good by the contractor at his own cost.
32. No blasting will be permitted during excavation in foundation. In hard rock strata excavation will be done by chiseling only. In this regard the decision of the Engineer will be final.
33. The contractor shall provide all the details, methodology, materials specification etc. to the authority or its representative for approval. The guidelines & directions given by the authority shall be final.
34. The contractor shall provide all the details, methodology, materials specification etc. to the authority or its representative for approval.

For approval of structural drawing:

- Proof checking of design and drawing from any NIT/ IIT with approved building plan and elevation is required.
- Recommended bearing capacity of soil strata is required.

Electrical General Scope of work

- 1 Concealed wiring: Concealed wiring shall be executed in accordance with the attached JPO circular No. 82/RE/250/1 dated 13.09.2002 and the latest correction slip 1, 2 & 3.
- 2 The wiring plan shall be approved by Sr. DEE/G/BPL or his authorized representative before commencement of the work and all electrical work should be carried out under supervision of concern SSE.
- 3 Wiring shall be protected by RCCB/ELCB with two proper earthing arrangements for local supply.
- 4 Air-conditioning requirement for the room: One (1) TR air conditioner is required for a 100 sq. ft. relay room area, with 100% standby (working spare) capacity. A bipolar timer shall be provided for continuous operation and automatic changeover from the working AC to the standby AC unit.
- 5 5-star 2 Ton window AC (actual cooling capacity not less than 7033 W) for covering area of 200 sq. ft., with 100% working standby spare, controlled, and protected with MS duct in a lockable cage will be ensure during execution of EPC contract.
- 6 A digital time contractor of 3 pole 40 A (230V single phase AC coil voltage) capacity is required for timely operation between 09:00 hrs. and 17:00 hrs.
- 7 separate power supply wiring shall be provided for the air conditioner (AC), complete with a proper earthing arrangement
- 8 Lighting shall be provided as per Railway guidelines. A minimum illumination level of 300 lux shall be maintained in the Relay Room IPS room & duty room, whereas 200 lux shall be maintained in the Battery Room
- 9 Provision of ceiling fans BLDC 1400 RPM shall be made considering 1 No. for every 150 sq. ft. of covered area.
- 10 Outdoor lights shall be provided as per site requirements, with an IP-65 or higher rating, and shall ensure a minimum illumination level of 100 lux.
- 11 If the existing power supply panel is required to be shifted, fresh cables of appropriate size, as per the maximum load of the existing panel, shall be supplied and laid (underground / under track / road / on pole / wall / tray) as per site requirements. In case the capacity or load of the existing panel is increased, the existing indoor/outdoor Main Distribution Panel shall be replaced with a higher-capacity panel by the contractor at his own cost.
- 12 If the electrical load increases due to addition of ACs at any stage, a new SDB panel shall also be provided as required.
- 13 For false ceiling areas: Recess-mounted LED fittings shall be provided. For areas without false ceiling: Surface-mounted LED fittings / inverter-based LED tube lights shall be provided for emergency lighting with a minimum of one inverter LED tube light in each room
- 14 Exhaust Fans: Battery Room: 2 No., 380 mm IPS Room: 2 Nos., 380 mm Toilets: 1 No., 300/380 mm each as per site requirements.
- 15 ON-load changeover switch of minimum 125 A or higher capacity, as per requirements suitable for both AT and local supply
- 16 At each location, an 8/12-way VDB and SDB shall be provided for lighting, fans, and other equipment, as per site requirements.
- 17 At each location, a 6-way 3 Phase VDB and SDB shall be provided for lighting, fans, AC's and other equipment, as per site requirements.
- 18 LT panel – LT panel is required as site requirements.
- 19 Online UPS of 2 kVA 96 Volt, capacity with 70 Ah batteries (08 Nos), 1 set needs to be supplied at every location.
- 20 1 number water coolers of 150-litre capacity shall be provided at each floor and every location.
- 21 1 number of 5 HP, 3-phase pumps are required to supply at each location, having a discharge head of 120–200 meters and a discharge capacity of 60–150 LPM. The pumps shall be connected with 50 mm dia GI 'B' class pipeline, and GI pipe required as per the requirement of bore well depth, starters, 6 sq.mm flat copper cables 300 meter or as per

- site requirements and required to supply and installed at desired place.
- 22 10% working spare and necessary tools must be supplied and kept at the store for maintenance purposes.
 - 23 Two fire extinguishers, Co2 type 5 kg are required at each location.
 - 24 2.5 KM LTOH and ACSR conductor is required, or 2.5 KM AB cable is required or as per site requirements with all accessories like Hanging tension Clamp fitting, Suspension clamp fitting, Dead end clamp fitting, Clamp for Neutral, Piercing conductor, Junction box with bus bar etc.
 - 25 3.5 KM 4 core PVC cable is required as per site requirements.
 - 26 10 Nos. of H beam of 152X152 mm of (37.1Kg/mtrs.) & 9 mtrs. Long along with earth coil complete with muffing & foundation as per site requirements.
 - 27 FRLS (Flame Retardant Low Smoke,) wires/conductors are used for wiring.
 - 28 FR (Flame Retardant) MMS conduit pipes are used for wiring and other electrical works.
 - 29 Warranty: Minimum 1-year overall warranty should be covered (except LED lights and ACs).
 - 30 LED Lights: 5-year warranty.
 - 31 Air Conditioners (ACs):
1-year comprehensive warranty 5-year warranty on PCB
10-year warranty on compressor

Specification for Earthing

1. A 300 mm x 300 mm x 300 mm (inside dimension) concrete box (wall thickness min. 50 mm) with smooth cement plaster finish shall be provided on the top of the pit. A concrete lid of 25 to 50 mm thick, with pulling hooks, painted black shall be provided to cover the earth pit. PVC sleeves of appropriate size shall be provided in the concrete wall to take out earthing connections.
2. The masonry work shall be white washed inside and outside.
3. Care shall be taken regarding the level of the floor surrounding the earth so that the connector is not too deep in the masonry or projecting out of it.
4. On the backside of the cover, date of test and average resistance value shall also be written with white paint on black background with date.
5. The earthing shall be carried out as per IS 3043-1966 or revised. The earthing should be complete in all respects-like connection, inter-connection etc.
6. Two separate and distant earth connections shall be provided for all metal parts, structures and equipment.
7. The earthing strip/wire laid in ground shall be buried 500 mm deep.
8. The buried earth strips/wire shall be applied with one bitumen coat. The earth connection strips of the main earth buried under ground shall be covered with dry sand 50 mm around.
9. Pipe electrodes shall be provided, and their dimension shall confirm drawings as per the relevant IS.
10. No. of earth electrodes shall be decided that combined earth resistance of earth bus shall not exceed more than 2 ohms for plate electrodes.
11. The distance between 2 earth electrodes shall not be less than twice the length of electrodes.
12. The size of the earthing conductor from earthing pit to the other end shall be of 6 SWG GI wire.
13. Pipe electrodes shall be provided, and their dimension shall conform to RDSO drawings no. ET/OHE/P/7020-MOD-B or latest & Plate electrode shall conform to drawing No. Sr. DEE/G/BPL/64/2002/113 or latest.

For Cabling

Whenever and wherever clamps & glands (brass cable glands) are required then they shall be shaped to accommodate the 'cable' and should be painted with two coats of red oxide and two coats of paint matching with general decor / surrounding surface.

1. Cable laying in trench:

This involves excavation of a 1000 mm deep trench in soil/hard murum/tar road/below Railway track then the bottom of the trench should be leveled, freed from stones / sharp edges of rocks. Then lay a bed of 75mm thick fine sand at the bottom of the trench. After this the cable shall be laid and then both sides are covered with 'B' grade bricks, thereafter sand to be filled on the cable by a 75mm thick layer followed by the final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

2. Cable laying in trench in rock:

This involves Excavation of a 750mm deep trench in rock. Then the bottom of the trench should be leveled, freed from sharp edges of rocks. Then lay a bed of 75mm thick fine sand at the bottom of the trench. After this the cable shall be laid and then both sides are covered with 'B' grade bricks, thereafter sand to be filled on the cable by a 75mm thick layer followed by the final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

3. Cable laying in loop form in each end:

This involves laying of cable in the trench at the end of the trench on a sand bed of 75 mm and covered by sand and bricks; all as provided in case of cable laying in trench.

4. Supply of 150mm dia. RCC pipe with collar and laying after excavation of 1000mm deep trench.
5. Erection involves excavation of a 1000mm deep trench in soil/hard murum/tar road/below Railway track. Then the bottom of the trench should be leveled, freed from stones / sharp edges of rocks. Then lay an RCC pipe at the bottom of the trench.
6. Cable laying inside 150mm dia. RCC pipe on road/track crossing and reforming original surface of the road/track.
7. This involves laying of cable in the RCC pipe already laid. Then filling the trench by sheaved earth. Then reforming the surface of this trench to match with the original surrounding surface.
8. Erection involves the Cable laying on wall/pole, fixing using MS flat [25x6mm.] clamps, nuts, bolts, screws or nails as per site requirement etc.
9. Supply of pipe, as per schedule, ISI marked pipe for cable support on wall/pole/road.
10. Erection involves fixing the pipe on wall/pole with MS flat [25x6 mm.] clamps, fixtures, bushing, nuts, bolts, grommet on each end of pipe & supply of these materials (MS flat [25x6 mm.] clamps, fixtures, bushing, nuts, bolts, Gromet etc.)
11. Supply portion under this item shall mean that cost of glands (brass cable glands), termination.
12. Erection involves connecting, commissioning cable with nuts, bolts, on both ends of cables & supply of these materials nuts, bolts etc.)
13. **Cable route marker:** Supply & providing cable route markers marked with 'L.T./H.T. cable' as required at every turning point/road crossing and at 20 Mtrs. distance. Erection involves foundation of cement concrete with 1:3:6

For Wiring: Technical data covers the general technical requirements of the various components in internal electrical installation works and wiring / rewiring system:

- (I)1) This system shall be done in PVC casing and capping (wire ways). The casing shall have a square or rectangular body. The capping shall slide-in-type with double grooving. All surfaces shall have smooth finish inside and outside.
- 2) PVC casing and capping shall be of good quality PVC free from defects like deformation, unevenness, blisters, cavities, ivory colour, only to be clamped supported, fixed at every 400 mm distance. Precision/Presto Plast / Modi/ V-Plast MAKE casing, capping is to be used.

- 3) The sizes of casing and capping for the various sizes of wires and maximum number of 1100 V grade PVC insulated, stranded copper conductor cables conforming to IS-694-1990 or latest, that can be carried in one casing and capping are as under:

Nominal cross-sectional area of conductor in sq.mm	10/15 mm x 10 mm	20 mm x 10 mm	25 mm x 10 mm	30 mm x 10 mm	40 mm x 20 mm	50 mm x 20 mm
1.5	3	5	6	8	12	18
2.5	2	4	5	6	9	15
4.0	2	3	4	5	8	12
6.0	--	2	3	4	6	9
10	--	1	2	3	5	8

- 4) The thickness of the casing and capping shall be approx. 1.2 mm +/- 0.1 mm. The casing shall be fixed by means of suitable head screws to approved type of asbestos or fiber fixing plugs at intervals not exceeding 40 cms for all sizes. On either side of the joints, the distance of the fixing arrangement shall not exceed 15 cms. from the joint. Screw head shall be counter sunk within the center of the casing. Alternatively, round headed screws may be used. The wire-ways in straight runs should be in single pieces so as to avoid joints. Joints in capping shall not overlap therein casing. Joints arising out of bends shall be done using standard accessories like elbows, tees, 3 way/4-way junction etc. casing to harmonies with decor.

- (II) 1) Conductors of wiring wires shall be of PVC insulated, multi stranded copper conductors (Colour code of RYB may be used for 3 phase wiring) of following sizes:

- (a) For light / fan / 5A plug / call bell point wiring, from switch board: 1.5 sq.mm
 (b) From SDB to switch board for light / fan / 5A plug : 2.5 sq. mm
 (c) From SDB to separate 5A switch board : 2.5 sq. mm
 (d) From SDB to separate 15A socket point wiring : 4.0 sq.mm
 (e) From SDB to 20A metal clad socket separate circuit (AC) : 4.0 sq.mm
 (f) For Sub-mains (Meter to SDB) : 6.0 sq.mm
 (g) For earthing 2.5 sq mm
 (h) For MCB 6-15 A 2.5 Sq mm
 25 A 4 sq mm
 32 A 6 Sq mm
 40 A 10 Sq mm
 63 A 16 Sq mm
 100A 25 Sq mm

- 2) Flexible cables/wires: Conductors of flexible wires shall be of copper of size 32/0.2 mm.

(III) **Wiring Accessories:**

- (1) Control switches (single pole switches) carrying current capacity 6A for Light & Fan, shall be Piano type and the switch shall be 'ON' when the knob is down. Combined switch-cum-socket shall not be permitted. The power (15A/16A) outlet shall be controlled by MCBs. The control switch shall be placed only in the live conductor of the circuit.

- (2) **Socket outlet:** Socket outlet shall be of Piano type as also their control switches. These shall be rated either for 5A/6A or 15A/16A. Combined 5A/15A or 6A/16A circuits only where specified. Sockets for the power outlets of rating above 1 KW shall be of Industrial type with associated plug top and controlling MCB. Outlet box for socket outlets (both for 15A/16A and 5A/6A) points in residential buildings shall be of size 175 mm x 100 mm. Unless and otherwise specified, the control switches for the 5A/6A and 15A/16A socket outlets shall be kept along with the socket outlets.

- (IV) **Ceiling rose:** Only the flexible cord shall be connected to a ceiling rose to fan, FT fitting etc.
- (V) **Lamp holders:** Lamp holders shall be type as required. The holder shall be rigid with sufficient threading for fixing.
- (VI) **Conformity to IE Act, IE Rules and tenders:** All electrical works shall be carried out in accordance with the provision of Indian Electricity Act 1910 or latest and Indian Electricity Rules 1956 or latest, or amended up to date. The work shall also conform to relevant Indian Standard Codes of Practice (COP).
- (VII) **General requirement of components:**
- All components in various installations shall be of appropriate ratings of voltage, current and frequency.
 - All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current which will normally flow through them without their respective ratings being exceeded.
 - All components shall conform to relevant Indian Standard Specification. Similar parts, say all switches, lamp holders, distributors, fuse boards, switchgear, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be inter-changeable in each installation.
- (VIII) **Passing through walls or floors:** When wiring cables are to pass through a wall, these shall be taken through a protection (steel/PVC) pipe or casing/capping with ends neatly bushed.
- (IX) **Joints in wiring:** No bare conductor in phase and/or neutral or twisted joints in phase neutral and/or protection conductors in wiring shall be permitted. No joints shall be in the through runs of cables. Termination of multi-stranded conductors shall be using suitable crimping type thimbles.
- (X) **Rating of outlets:**
Ceiling fans, exhaust fans, all light lamps and fittings etc. shall be rated according to their capacity. 5A/6A & 15/16A socket point shall be rated at 100W and 1000W respectively.
- (XI) **Capacity of circuits:**
- 1) The lighting circuit shall not have more than a total of 6 Nos light/ fan and socket outlets.
 - 2) Power circuits shall be designed with only one outlet per circuit. The circuit shall be designed based on the load where not specified. These loads shall be taken as 1 kW per outlet.
 - 3) Load more than 1 KW shall be controlled by an isolator or miniature circuit breaker (MCB).
- (XII) **System of distribution:**
- Main Distribution Board shall be controlled by circuit breaker or linked switch with fuse. Each outgoing circuit shall be controlled by a switch with fuse/circuit breaker.
 - Branch Distribution Board shall be controlled by a linked switch fuse or a circuit breaker. Each outgoing circuit shall be provided with a fuse/ a circuit breaker on the phase of the live conductor. The earthed neutral conductors shall be connected to a common link and be capable of being disconnected individually for testing purposes. The DB shall be fixed on suitable support/ fixture or walls and shall be accessible for replacement of MCBs / Fuses. The DBs shall be weather proof type, if exposed to weather or damp situations.
- (XIII) **Exhaust fan:**
- Exhaust fans shall be erected at the place indicated by Engineer-in- charge, for fixing an exhaust fan, a circular hole shall be provided in the wall to suit the size of the frame, which shall be fixed by means of rag bolts embedded in the wall. The hole shall be neatly plastered to the original

finishing of the wall. The exhaust fan shall be connected to the exhaust fan point. Wiring of exhaust fan points should be done using 1.5 sq.mm copper wire.

(XIV) Earth continuity:

- A protective (earth continuity) conductor shall be drawn inside the casing & capping for earthing of all metallic boxes of the installation as well as for connection to the earth pin of the outlets. The earth continuity wire shall be PVC insulated copper conductor wire suitable as per size of main wire confirming to relevant IS and IE rules.
- Location for earth electrodes: Normally an earth electrode shall not be located closer than 1.5 M from any building. The earthing arrangement shall be done as per drawing of 3043-1966 or revised.

(XV) The Wiring plan should be approved by the Electrical engineer prior to the start of the work.

(XVI) The control board shall be PVC/modular.

(XVII) The maximum number of wires to be run inside the metal conduit pipe shall be as under:

S. No.	Size of wire	16 mm (1.2mm thick)	19/ 20 mm (1.5 mm thick)	25 mm (2 mm Thick)	40 mm (2 mm thick)	32 mm (2 mm thick)
1.	1.5 sq.mm	2 nos.	5 nos.	8 nos.	--	12 nos.
2.	4.0 sq.mm	2 nos.	3 nos.	7 nos.	--	10 nos.
3.	6.0 sq.mm	--	2 nos.	5 nos.	--	08 nos.
4.	10 sq.mm	--	--	3 nos.	6 nos.	04 nos.

(XVIII) Concealed Conduit wiring system:

This system of wiring shall comply with all the requirement described above under ‘surface Conduit System’ and in addition, confirm to the requirements described under:

The conduit shall be fixed in position by means of M.S. hooks not more than 60 cm. apart by making a chase in the wall. The conduit shall be fixed so that its top is 6mm below the surface of the wall. The chase shall be of ample dimension to permit the conduit to be fixed properly and shall be made neatly in the wall. The chase shall be filled up neatly after erection of conduit.

The outlet boxes shall be the same as for surface conduit systems and shall be mounted flush with the wall/ceiling.

Wiring in PVC Conduits:

The P.V.C. conduits shall be of approved make and brand, I.S.I. marked of medium duty minimum 1.6 mm thick. The couplers, inspection boxes, long neck, solid bends shall also be of heavy duty P.V.C.

The system of wiring shall comply with all the requirements described above in rigid steel conduit system and in addition confirm to the requirement described here under.

The earth continuity wire of 2.5 sq mm, shall be PVC insulated in Green colour copper wire and shall be carried inside the conduit of suitable size.

For LT Panel like MDB / SDB:

Scope: The specification covers the design, manufacture, supply, connecting, testing and commissioning of LT panels.

1.0 The LT panel shall be suitable for the following systems:

- a) Rated Voltage : 433 Volt, 3 PHASE, 4 wire
- b) Rated Frequency : 50 Cycles

2.0 Site Conditions:

- a) Ambient temperature : 45° C maximum
: 05° C minimum
- b) Humidity : 80% maximum
(Maximum temperature & humidity are not likely to occur simultaneously)

3.0 Standards:

The design, manufacturing and testing of various equipment covered by this specification shall comply with the latest issue of the following standards:

- a) IS-4237: General requirement for switchgear and control gear for voltage not exceeding 1000V.
- b) IS-4047: Specification for Heavy Duty Air break switches and composite units of Air break switches and fuses for voltage not exceeding 1000 volts.
- c) IS-2208: Specification for HRC cartridge fuse-links up to 650 volts.
- d) IS-2705: Specification for current transformer.
- e) IS-1248: specification for electrical indicating instruments.
- f) IS-2516: Specification for alternating current circuit breaker.
- g) IS-2147: Degree of protection provided by enclosures for low voltage switchgear and control gear.

4.0 Constructional features:

- 4.1 LT panel shall be sheet steel cubicle, indoor, floor mounting, and dead front free-standing type. The design shall be totally enclosed, completely dust tight and vermin proof. The sheet steel used shall be 2.0 mm thick, gaskets shall be used between all adjacent units and beneath all covers to render the joints effectively dust proof.
- 4.2 Sheet steel work shall be of high quality. All opening and cut outs in the doors shall be free from burrs. Weld runs shall be ground smooth. All sheet surfaces shall be free from dents and hammer marks.
- 4.3 A base channel of 50 x 40 mm fabricated out of 3 mm thick hot rolled sheet steel, painted black shall be provided to prevent corrosion of the sheet steel cubicles and to facilitate cleaning of floors. For convenience of operation and ease of cable termination, there shall be a gap of at least 140 mm between the floor level and bottom most unit.
- 4.4 The design shall be based on modular construction. The LT panel shall be easily extensible and shall have a high degree of flexibility. The arrangement shall be logically compact and neat.
- 4.5 Barriers shall be provided between the modules accommodating equipment associated with outgoing circuits.
- 4.6 All vertical sections shall have a covering at the bottom so that entry of dust, rats, vermin is not possible.
- 4.7 The LT panel shall be of single front construction. The sheet used at the back of the panel should be fixed using bolts and nuts i.e. it should be removable in the outdoor type of panel door + gaskets + sloped top etc. should be provided to give required protection.
- 4.8 LT panel shall be dead front type. All switches shall operate from the front. The rating of ACBs and fuse switches & all others shall be as specified in schedule. Outgoing feeders shall be neatly arranged in different compartments.
- 4.9 The maximum operating height shall not exceed 2000 mm.
- 4.10 The framework shall be made of steel sheets, folded to impart strength, which will also serve as continuous barriers between logically arranged switchboard components. The entire arrangement of horizontal and vertical bus bars unit compartments and cable space shall be modular. The framework shall house scheduled items MCCBs / MCBs, with HRC fuses, indicating lamps R.Y.B. Ammeter and volt meter with selector switch, Bus bars, cable alloy, CT, ammeter, voltmeter with selector switch, etc. with individual doors. All doors shall be held securely against sponge rubber

gaskets to make the equipment dust tight. All hinged doors shall be provided with insulated thumb screws. Adequate lifting facilities shall be provided for each shipping section to facilitate handling and transport. It shall be possible to choose compartment sizes easily and arrange them in desired fashion at design stage. The compartment sizes shall be integral multiples of one basic size.

- 4.11 Each circuit shall be ACB/ MCCB/MCB etc. as specified.
- 4.12 The compartment doors should be so interlocked that it shall not be possible to open the door with the switch in a closed position. An arrangement for defeating this door interlock shall be provided if asked for.
- 4.13 Outgoing links from feeders shall be rigidly supported and suitably extended in the cable box chamber for case of cable connections. Cable lugs and links shall be covered by insulating shields.
- 4.14 Equipment offered shall be capable of withstanding the rigorous industrial environment and resisting rough handling during transport. The design, arrangement and finish shall be elegant, and workmanship shall be of high order.
- 4.15 Normally, equipment for individual feeders shall be accommodated in separate modules.

5.0 Switchgear details of the board: As per schedule.

6.0 Bus bar rating: 1000A/500A/200A or as per design requirement for the LT panel/MDB/SDB etc. considering the ratings of switchgears & total rating of all ACB/ MCCB/TPN/MCB etc. provided and taken further.

- 6.1 Three phase and neutral copper / Aluminum bus bars shall be provided.
- 6.2 Bus bars shall be housed in separate bus bar chambers. Horizontal bus bars shall be extended throughout the length of panels. The bus bars shall be suitably traced to withstand the fault level. The bus bars shall be supported on unbreakable, non-hygroscopic hylum supports rigidly held to the framework of the chamber.
- 6.3 The bus bar chamber shall have a separate screwed cover, and means shall be provided to identify the various phases of the bus bars.
- 6.4 Cable runs should not prevent or obstruct access to the bus bars. The connectors between horizontal and vertical bus bars shall be short and neat.
- 6.5 Connections between vertical bus bars and MCCB / MCB terminals shall be preferably fully enclosed so as to leave no exposed live parts and shall present a neat appearance. It shall be possible to work on the MCCB / MCB outgoing connections without any danger of accidental contact with live connections between the bus bars and MCCB / MCB.
- 6.6 The outgoing terminals of the breaker shall be brought to the rear cable chamber by means of suitable supported links for easy access and connection of cables.

7.0 Cable space:

- 7.1 Ample cable space designed to accommodate cables shall be an essential feature of the design.
- 7.2 The access for cabling shall be from the back of the switchboard.
- 7.3 LT panel shall be designed to facilitate cable entry from top and bottom as the case may be. Removable sheet steel plates shall be fitted at the top and bottom for cable entry at site.

8.0 Painting:

All steel work shall undergo a process of degreasing, pickling in acid, cold rinsing. Phosphatizing, passivating and then being sprayed with a high corrosion resistant primer. The primer shall be baked in an oven. The finishing treatment shall be application of two coats of synthetic enamel or power coating of approved shade followed by stoving.

9.0 Fuses: Fuses shall be HRC type (rewireable fuses are not acceptable) breaking capacity corresponding to the short circuit fault level obtained on the system. They shall be provided with visible indicators to show that they have operated. It shall be possible to remove the fuses using an insulated fuse pulling handle without the help of any other tool.

10.0 Wiring:

- 10.1 LT panel shall be completely factory wired, ready for connecting to the equipment.
- 10.2 Power connection of the circuits shall be done by copper flats of adequate sizes or PVC insulated copper / Aluminum wires. Control wiring shall be done by PVC insulated wires of minimum size 1.5 sq mm copper. All control wiring shall be fitted with identification ferrule at each end. Not more than two connections shall be made at any one terminal. The wires shall be arranged and supported in such a manner that there shall be no strain on terminations.
- 10.3 The terminals shall be of adequate current rating and size to suit individual feeder requirements. Power terminals shall be pressure clamp type suitable for copper / Aluminum wires. The cable lugs shall be mounted in such a manner so as to facilitate cable connection. Terminals shall be joined in the cable compartment behind feeder compartments, and all power wire shall be terminated at these for connection to the purchaser's cables.
- 10.4 Tapping connections at the bus bar shall be pressure clamp type or made with nuts, bolts and washers. But bars shall not be tapped for terminating wire connections.

11.0 Metering:

Incoming feeder panel shall be provided with voltmeter with voltmeter selector switch and ammeter with ammeter selector switch.

12.0 Indicating Lamps:

Indicating lamps for 3 phases, R, Y, B for indicating whether the bus bars are live or not, should be provided.

- 13.0 **Cables:** Engraved PVC cables shall be provided on all the incoming and outgoing feeder compartments. The exact legend to be engraved will be furnished with the order.

- 14.0 **MCBs:** 'C' series- for light fan inductive load and all power circuits.

Supply, fixing, testing and commissioning of 2.5 Sq.mm. single core copper conductor:

This item includes supply of single core 2.5 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/conduit pipe etc. of all kinds of wiring for connection of electrical switchgear/equipment as per standard wiring practice in groups as per the site requirement.

Cable laying inside GI pipe on road/track crossing or as per requirement and reforming original surface of the road/track. This involves laying of cable in the GI pipe already laid as per requirement. Then filling the trench by sheaved earth. Then reforming the surface of this trench to match with the original surrounding surface.

Supply, fixing, testing and commissioning of 4.0 Sq.mm. single core copper conductor:

This item includes supply of single core 4 Sq mm multistrand copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kinds of wiring for connection of electrical switchgear /equipment as per standard wiring practice in groups as per the site requirement.

Supply, fixing, testing and commissioning of 6.0 Sq.mm. single core copper conductor:

This item includes supply of single core 4 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kinds of wiring for connection of electrical switchgear /equipment as per standard wiring practice in groups as per the site requirement.

Supply, fixing, testing and commissioning of 10.0 Sq.mm. single core copper conductor:

This item includes supply of single core 10 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit

pipe etc. of all kinds of wiring for connection of electrical switchgear /equipment as per standard wiring practice in groups as per the site requirement.

For Ceiling Fan:

Technical Specification for ISI marked BLDC Ceiling Fan:

Type	Brushless DC (BLDC) Motor
Power Factor	0.95 or more
Voltage	140V to 285V AC
Maximum Power Consumption	35 Watts or Less
Input Current	0.2A to 0.6A
Frequency	50 Hz / 60 Hz
Efficiency	Minimum 70% to 80%
Fan Blade Material	Aluminum
Fan Blade Sweep Diameter	1400 mm (56 inches)
Number of Blades	3
Fan Blade Thickness	Minimum 1.1 mm
Material Finish	Powder-coated for better durability and aesthetic appeal
Air Delivery	Minimum 270 CMM (Cubic Meters per Minute) at full speed
Rotational Speed	Minimum 280 RPM (revolutions per minute)
Control Type	Compatible with all brands electronic regulator
Speed Control Features	5 Speed control (with electronic regulator)
Noise Level	Less than 65 dB (decibels) at full speed
Star Rating	5 stars by Bureau of Energy Efficiency (BEE) in India
Service Value	7.7 and above
Bearing type	Double Ball bearing
Winding Type	Copper
Length of down rod	300 mm
Shank and Shackle thickness	Minimum 2 mm
Other Salient Features	Resistant to abrasion, hassle free operations, Trendy design
Accessories in scope of supply	Nut-Bolt, Clamps
Test certificate of complete product	From NABL accredited Lab

For ACSR conductor:

This item covers the erection, stringing, testing & commissioning of AAAC/ACSR conductor of size as mentioned in the tender schedule. Erection of conductor shall cover supply of required suitable aluminum wire for binding with insulator and at other places as required, clamps etc. complete of suitable size for jumpering and then erection, stringing, tensioning of these conductors using the material so supplied on the insulators erected to form the LT line. Then testing and commissioning shall be done. This also covers supply, erection, stringing, tensioning of 8 SWG GI wire for guarding, fasteners etc. for jumpering and provision of lacing with 8 SWG GI wire at every interval of 1.5 meters to form guarding cradle for the overhead line.

For RSJ pole:

Supply and erection of RSJ pole of 9 mts. long. This involves a supply of 9 mtrs. long RSJ pole of 19.6 kg/mtr. The pole shall be drilled for fixing of fittings as per site condition. It includes the excavation of a pit in the earth for approx. 1/5 meters the length of the pole and making of foundation with cement

concrete. The poles shall be painted by two coats of red oxide and two coats of bituminous paint for the length embedded in ground/ plinth, then two coats of aluminum paint after erection at the site & connection of earth wire of 8 SWG GI wire connected while erection with concreting of H-beam pole. The erection of pole shall be done to suit the termination of ACSR Conductors or cable for LT overhead power line and fixing of light fitting on the pole.

LTOH line of 5 ACSR:

Supply, Stringing, connecting, testing and commissioning of LTOH line of 5 ACSR, 2 Nos. 8 SWG GI Wire, cradle guard etc. to be fixed on cross-arms provided on poles. The spacing of cross cradle guards' wires should not be more than 3 Mts with erection of pole in truly vertical position with re-fixing of existing MS channel cross-arms and with supply of pin insulators on straight runs and shackle insulators at ends, MS clamps, washers, nut-bolts etc. including excavation of pole pit, preparation of cement concrete foundation, muffing etc.

Supply and Erection of stay set of 20 mm with stay clamp complete with all accessories for pole:

Supply portion under this item shall include supply of complete stay duly painted with two coats of red oxide paint and two coats of bituminous paint for the length to be embedded in ground & plinth and two coats aluminum paint for the remaining portion, straining screw, loop insulator, GI stay wire [7/10] SWG, angle iron bracket of 50x50x6mm with clamps of MS flat of size 50x6mm. The erection under this item includes excavation of pit for foundation, supply of cement concrete for foundation; making of foundation using 1:3:6 ratio cement at angle as per drawing; the assembly of all the supplied parts suitably using required fasteners to form the complete stay set. The concreting of stay supplied then testing shall be done.

Online UPS Rating 2.0 KVA: Technology- IGBT-PWM, Input voltage- AC Single phase 160V-260V 50 Hz, Output voltage- AC Single Phase 230V +/-1% 50Hz Pure Sinewave, Minimum Backup time- 120 Minutes, Movable trolley for battery, Battery make- Exide, Amron, Degree of protection- IP20, Cabling 6 meter for input and output, installation and commissioning, minimum thickness of M.S sheet enclosure- 1.0 mm, Type of battery- SMF-VRLA, Nos. of battery- 08, Battery capacity- 70 Ah, DC Bus voltage- 96 Volt, Power factor at rated load- 0.9 or better, 20% overload limit for mini. 5 minutes, Overall Efficiency- 90%, THD- Maximum 3%, Indicator for mains presence, indicator for battery charging and discharging indicator for output over load OEM Certificate and Availability of test report from Central Government lab/NABL/ILAC accredited lab.

5 KG Store Pressure Type Fire Extinguisher conforming as per IS:15683: 2018 (latest amendment), Type- Stored Pressure, Extinguishing Media- Powder Based (as per IS 4308), Expellant Medium- CO₂, Cylinder Material as per latest IS, Powder based Extinguishing Media- ABC, Features of Fire Extinguisher - Carrying Handle (Mandatory if Extinguisher having mass 1.5kg or cylinder diameter, Safety, Devices (Mandatory for High Pressure Extinguisher), Rechargeable, Hose Assemblies (Mandatory if mass or volume of Extinguishing medium > 3 Kg or Liter), Pressure gauge range- 15 bar, Class of fire for which fire Extinguisher is suitable- Class-B, Operating Temp- (-30 Deg C to +60 Deg C), Test pressure for all fire ext. - 35 bar, Burst pressure for all fire ext.- 55 bar, minimum effective discharge time for fire ext.- 12.5 Second, Fire Rating of different class of fires- 55B, Discharge range of class-A, class-B and Class-C fire ext.- 2 meter, BIS Marking, Availability of test report from central Govt/Nabl/ilac Accredited lab to prove conformity to specification.

LED Ceiling/Ultima complete with suitable fixtures, clamps and SS nuts and bolts etc. size (2ft. x2ft. x9mm), diffuser material polypropylene (UV stabilized reflector type) body epoxy powder coated, operating input voltage- 140-270V AC 50Hz single phase, View angle- 120 degree, THD<10%, CRI >75, surge voltage 1.5kV +/-3% for 50 microsecond, lumens output 100L/W, PF 0.95, colour temp. 5700K-6500K, cool white light, protection-IP20, LED LM80/IS:16105 test report support the same, Driver shall comply the performance and safety requirement as per IEC:62384/IS:16104 & IEC/61347-2-/61347-2-13/IS:15885-2-13 with test certificate of NABL accredited laboratory shall be submitted,

Energy Efficient Storage Type Water Cooler Capacity 150L (Storage) and cooling capacity- 150L/HR, eco-friendly non CFC refrigerant, Maximum energy consumption- 1550 Watt 150L/hr Cooling cap, PF- 0.85, ISI Marked, Water tank and Cooler sheet material and thickness- Stainless Steel(Grade AISI 304), Water tank cover and lid bottom sheet material- High impact Polystyrene, Conforming as per IS:1475 latest, Availability of test report from Central Govt/NABL/ILAC accredited lab to prove conformity to specification

PVC insulated (Heavy Duty) Electric Cable 4 core x 25 or 70 Sq. mm Aluminum conductor Conforming as per IS:1554 (Part1):1988 latest, BIS Marked, PVC compound outer Sheath- ST-1, Type of compound insulation- A, Use of armoured – Galvanized steel strip armoured, working Voltage up to and including 1100 Volts, Construction of conductor – Stranded, Material of conductor- Al, Filler and inner sheath- Thermoplastic materials,.

LED Weather proof 40 W surface/pendant mounting LED tube fitting complete with corrosion resistant dust and water proof unbreakable polycarbonate body off white finish, frosted PC diffuser for glare free uniform light, protection-IP65, constant current above Isolated driver, input voltage range 140-270V AC 50Hz single phase with higher voltage auto cut off, PF- 0.95, THD<10%, colour Temp. 5700K-6500K, view angle – 120 Degree, output lumens- 100 Lm/W, CRI>75, mini. Efficacy of driver 85%, short circuit and open circuit protection mini-Surge voltage - 1.5 KV, LED LM80/IS:16105 test report supports the same, Driver shall comply the performance and safety requirement as per IEC:62384/IS:16104 & IEC/61347-2-/61347-2-13/IS:15885-2-13 with test certificate of NABL accredited laboratory shall be submitted,

LED Tube fitting with Alu. body indoor type 20-Watt energy efficient fitting complete with SS clamps and fixtures approx. 1150mm long, Colour Temp. 5700-6500K, CRI>80, View angle 120-degree, Operating Voltage (140-270V), Surge voltage - 1.5 KV \pm 3% for 50 microseconds, THD<15%, PF 0.90, output lumens- 100 Lm/W, CRI>75, mini. Efficacy of driver 85%, short circuit and open circuit protection, LED LM80/IS:16105 test report supports the same, Driver shall comply the performance and safety requirement as per IEC:62384/IS:16104 & IEC/61347-2-/61347-2-13/IS:15885-2-13 with test certificate of NABL accredited laboratory shall be submitted at the time of Bid,

LED street light fitting 45 watt diecast aluminum body along with sufficient heat sink fins to dissipate heat, Input voltage range 140V to 270 V AC, Power factor 0.95, Efficiency 85%, Surge protection of 1.5KV, THD<10% High power LED with silicon resin and silicon lens suitable for outdoor application with 100 lumens/Watt, view angle of lens should be 120 degree CRI>75, colour Temperature of 5700K-6500k, open and short circuit protections, over voltage, complete and toughened glass with IP-66, LED LM80/IS:16105 test report support the same, Driver shall comply the performance and safety requirement as per IEC:62384/IS:16104 & IEC/61347-2-/61347-2-13/IS:15885-2-13 with test certificate of NABL accredited laboratory shall be submitted,

Energy efficient Submersible Pump Motor Set 5 HP, Minimum Head 120 m, Maximum Head 200 m, Minimum Discharge 60 LPM, Maximum Discharge 150 LPM, delivery size 38 mm 4-inch dia pump, suitable for 3 phase 415-volt 50Hz AC supply.

5 HP Starter Panel (DOL) type, ISI marked MCB, with all protective relay, indication lamps, voltmeter, AMP m phase preventer. Suitable for 3 phase, 415 volts +6%, -10% volts, 50 Hz electrical supply.

ACSR Conductor for overhead transmission purpose conforming to IS:398-part II/1996 with amendment No.1, 2 and 3 (Reaffirmed 2007), ISI Marked, Nominal size-50 sq.mm, standard conductor length- 1500 meter Approximate with test report of NABL/ILAC/Central Government Lab to prove conformity of products to the specification.

20 Watt Outdoor Battery/INVERTER LED Batten Tube fitting wall mounted with Charging time - 12 Hrs, Colour Temp. 6000K, CRI>80, Operating Voltage - 140 V, Surge Protection - 3.0 KV THD<30%, PF 0.95, Lumens - 100 Lm/W, Driver Efficiency \geq 85%, Emergency time 3 Hour, System current <106

mA, Rated voltage – 230 V AC, Operating temp. (-60 Degree C), Wiring material – Copper, Electric control gears, Housing material - Aluminum Extruded, Front cover material – Polycarbonate, Number of battery – 1, Battery backup - 3 Hour with test certificate of NABL accredited laboratory shall be submitted.

1.5 Ton Window AC Specification		
S. No.	Description	Value
1	Cooling capacity as per BEE Star	1.5 Ton
2	Air Condition technology	Inverter AC (Variable Speed)
3	Conforming as per IS	IS:1391 (latest) Part-2
4	Rated Cooling Capacity	5100 Watt Minimum
5	BEE Star rating	5
6	ISEER	3.55 and above
7	BIS Certification	Yes
8	Compressor type	Rotary type
9	Refrigerant gas type	Environmentally Friendly
10	Coil Evaporator and Condenser material	Copper
11	Operating Temp. Range	16~52
12	Input Power 230 V AC 50 Hz,	230 V +/- 10% AC Supply 50 Hz
13	Noise Level(indoor/Outdoor)	As per IS:1391 latest
14	AC Mode	Turbo mode, Dehumidification Mode
15	Features & accessories	Anti Bacteria filter, Sleep, Auto Off, Auto Restart, Indoor Temperature indicator, Dust filter and control, Operating Manual.
16	Installation	with Installation & Suitable Clamp or stand
17	Warranty	
17.1	AC Machine warranty in year	01 Year
17.2	a) PCB warranty	5 yrs.
17.3	b) Compressor warranty	10
18	Special condition - Supply installation, testing and Commissioning of good	Yes
19	Test Report	Availability of type test report from Govt Lab/NABL/ ILAC accredited lab as per IS:1391 (part-2) and Test report number and date must be declared by NABL.
20	ATC terms:	
20.1	Standard installation with suitable length 3 core copper electric wire	Yes
20.2	OEM authorized Bid required	Yes

AB Hanging tension Clamp fitting for LT AB cable: - This item covers supply of AB hanging tension clamp fitting complete with all accessories / hardware suitable for erection of LT AB cable of requisite size as mentioned in tender schedule. It also includes drilling, cutting, machining, etc. for arranging required shape and size as per site requirement and then its fixing/erection on the erected pole.

Suspension clamp fitting for LT AB Cable: - This item covers supply of suspension clamp fitting complete with all accessories / hardware suitable for erection of LT AB cable of requisite size as mentioned in tender schedule. It also includes drilling, cutting, machining, etc. for arranging required shape and size as per site requirement and then its fixing/ erection on the erected pole.

Dead end clamp fitting for LT AB Cable: - This item covers supply of dead-end clamp fitting complete with all accessories / hardware suitable for erection of LT AB cable of requisite size as mentioned in tender schedule. It also includes drilling, cutting, machining, etc. for arranging required shape and size as per site requirement and then its fixing/ erection on the erected pole.

Clamp for Neutral for LT AB Cable: - This item covers supply of clamp fitting for neutral complete with all accessories / hardware suitable for erection of LT AB cable of requisite size as mentioned in tender schedule. It also includes drilling, cutting, machining, etc. for arranging required shape and size as per site requirement and then its fixing/ erection on the erected pole.

Piercing conductor for LT AB Cable: -The work includes the supply of insulation piercing connector suitable for LT AB cable of requisite size as mentioned in tender schedule and its erection includes fixing of the connectors on the cables at desired locations as directed by the Railway Engineer.

AB cable -The work includes the supply of LT Aerial bunched cable of requisite size confirming to IS 14255/1995 with latest amendments. The work also includes the erection of the Aerial bunch cable on the already erected poles along with appropriate accessories. All the necessary tools & plants, machinery required for the erection work will be supplied by the Contractor at their own cost. The contractor has to manage all activities related to successful erection of LT AB cable. It consists of handling, pulling, stinging, jointing, change in direction of cable etc. as per the site requirement and direction of Railway Engineer. The cable should be tied at appropriate distance with the help of PVC tie to hold the cable.

Spring loaded CP multi connection Bus bar -Spring loaded CP multi connection Busbar in insulated Box suitable for 3 phase and 6 outgoing distribution Box or as per requirement. Fixing on pole with clamps for Aerial Bunch Cable The work includes the supply of multi connection busbar enclosed in insulated box suitable for making three phase connection from AB XLPE cable as mentioned in the tender schedule and its erection with proper clamps, nuts & bolts for fixing on the pole and making connection from AB cable

NOTE - Work shall be carried out as per the scope of work, attached specifications and attached JPO or latest correction slip, under the supervision of SSE/Elect/G.

Technical Specification for Electrical TRD work

All materials used in the work shall be of the best quality and of the class most suited for the purpose specified and **procured from the sources approved by RDSO/CORE**. All the equipment's, materials, fittings and components will be subject to the quality control program of the manufacturer, being part of the quality Assurance program of the Contractor. The materials may also be inspected by the Purchaser or his representative either at the manufacturer's works or at the Contractor's depot. All erection work carried out shall be of best quality acceptable to the purchaser to be done as per specification and drawings. The purchaser's representative shall have the right to be present during all stages of manufacture and contractor shall accord free of charge all reasonable facilities required for inspection and testing.

Scope of work:

(a) Supply, erection, testing and commissioning of 25 KVA AT power supply (Double line, 01 AT UP line and 01 AT DN line i.e. Total $6 \times 2 = 12$ No. ATs for 6 stations i.e. SGBJ, CKKD, CAER, BARUD, DRHI and ET-B cabin) with CLS panel, cables and all its associated accessories including foundation of mast at every station except BIR. All material shall be supplied and installed by the contractor at his own cost.

(b) Supply, erection, testing and commissioning of CLS panel with cabling and all its associated accessories for existing 10 KVA AT at BIR station. All material shall be supplied and installed by the contractor at his own cost.

Details of scope of work and its specification are given below:

1. All the necessary cables required for deriving the power supply from CLS panel to IPS Room, Telecom Equipment room and other locations wherever supply is required shall be supplied, laid and terminated.
2. The CLS panel shall have minimum 3 sources of input. The source selection shall be by default automatic.
3. All the RDSO/CORE-approved material shall be procured from RDSO/CORE approved vendors only. Inspection of the materials shall be as per extant inspection policy of WCR.
4. The cable entry shall be done via GI pipe and proper dressing shall be done for the cable as well as pipe to look aesthetic.
5. It shall include all the supply, execution & commissioning of power supply arrangements for the Signaling & telecom system i.e., Starting after AT mast/ local supply pole or junction to IPS, which includes supply & execution of junction box at AT mast/local supply pole or junction, cabling from AT mast to Auto changeover system and further to IPS (including supply of Cables, wires, mini relays, Auto change over panel, necessary items for laying & trenching) connection to the datalogger for monitoring etc.
6. Miscellaneous accessories, fixtures, sundry materials, terminals, lugs, tapes etc. shall be supplied & installed.
7. Earthing of the CLS or any other equipment shall be done separately (separate from S&T Earth).
8. The AT is available at BIR station. The existing AT (or upgraded by Railway in nearby location) shall be utilized for tapping power supply to the newly supplied and installed CLS panel under this contract. Supply and laying of cable along with all associated accessories from existing AT to new CLS panel is covered in this scope of work and to be done by contractor at his own cost. This is applicable only for BIR station.
9. The input supply as well as output supply shall be monitored through datalogger. Necessary miniature transformer/Relay shall be supplied & installed.
10. Writing work shall be done on the CLS panel to identify the input/outputs.

(1) Excavation and casting of foundation & plinth in concrete other than hard soil and rocky soil:

The price shall cover excavation, supply and handling of all materials and accessories, temporary arrangements for excavation in other than hard soil, rocky soil and concrete/masonry drains/walls requiring use of chisel and hammer or requiring blasting. Shoring where necessary, casting concrete including frame work where necessary, tamping of concrete, grouting of masts and finishing the top of concrete foundation or anchor blocks. 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 foundation for structures shall be casted after excavation as per IS:456/2000 (or latest version) and Railway Drg. The concrete for foundation shall be a nominal mix of grade M.10 (1:3:6) obtained by mixing cement, coarse aggregate and fine aggregate and water in accordance with proportions given in table 3 of IS:456/2000 (or latest version). Drawings pertaining to the location of excavation and casting of foundation shall be made available to the successful tenderer only.

Other details of foundation, grouting and muffing:

a) Size and grading of aggregates: The coarse and fine aggregates shall conform to IS: 383/1970 (or latest version). The coarse aggregate for casting of foundation and for grouting shall be of nominal size 40mm & 20mm respectively. The fine aggregate shall be graded from 20 mm down wards.

b) Cement: For casting of foundation, grouting and muffing 53 grades ordinary Portland cement to IS: 12269/1987 (OR latest version) shall be used.

c) Test: In judging the acceptability of the materials quality of concrete and the method of work, the contractor will generally observe the provision of the IS:456/2000 (OR latest version) "Indian Standard Code" of practice for plain and reinforced concrete. The crushing strength of concrete shall not be less than the limits given below:

Crushing strength of 15 Cm. cubes by works test:

S. No.	Concrete	At 7 days	At 28 days.
01	M-10	70 kg/cm ²	100kg/cm ²
02	M-15	100 kg/cm ²	150kg/cm ²

NOTE:

i) Test specimens shall be taken at the site of work from a mixture of concrete ready by pouring in the foundation hole. All tests shall be carried out in accordance with IS: 516/1959 or its latest version. The sample of concrete from which test specimens are made shall be representative of the entire batch.

ii) Age will be reckoned from the day of castings.

iii) Curing of re-inforced concrete will be done in accordance with IS:456/2000 or latest (curing period will be 28 days).

(2) Supply and Erection of steel structure galvanized including Traction masts, AT masts, Fabricated steel other than mast, SPS etc. for OHE:

Supply of steel structure mast, TTC, Portal of OHE comprising rolled and broad flange beams and anchor foundation U bolt and fabricated structures including gantry mast for switching station & L.T. supply transformer stations/SPS, dwarf masts or 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 is carried out by the contractor etc. The price shall cover cost of fabrication, Galvanization, supply, erection, alignment and setting before grouting of individual traction masts whether rolled or fabricated and shall include masts for head spans Galvanization thickness shall be as per Railway specification No. ETI/OHE/13 with its latest amendment.

Prices shall also include supply and erection of Galvanization bolts, nuts, washers etc. wherever required as per the approved designs and drawings. The transportation of material will be done by contractor.

Note: For the purpose of payment, the weights of individual traction masts and masts of head span whether rolled or fabricated shall be determined for each type on the basis of the payable weight per meter length shown below for standard types. For special types, the payable black weight per meter length will be indicated by the purchaser at the time of approval of drawings.

1. The prices shall also include the cost of stenciling of location number on masts/portal uprights in the manner as directed by the purchaser. The price shall also include the straightening of masts/portal upright bent during transit and cutting of masts/portal upright to suit the site condition.
2. For standard fabrication steel work for which RDSO/CORE approved drawings are available, the weight of steel work as specified in RDSO/CORE 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 nonstandard 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.
3. For the purpose of payment, the weight of structures or fabricated steel work will be calculated according to the weight of black steel given in section books for the lengths of various numbers shown in the approved drawings.
4. The rates shall be applicable to the erection of small part steel work, which are not covered under the various other items of work. 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 manual erection of steel structure galvanized including Traction masts, AT masts, fabricated steel other than mast, SPS etc. for OHE:

The price shall cover the cost of erection, alignment and setting before grouting of individual OHE mast. (For the purpose of payment, the weight of an individual OHE mast shall be determined for each type on the basis of the payable weight per meter length and per weight given in the table of railway standard. For special types, the payable weight per meter length will be decided by the purchaser at the time of approval of design.

Erection shall be done as per approved drawing, which will be made available by successful tenderer. For grouting, mulling, embedding of structures in foundations, nominal mix concrete M.15 (1:2:4) obtained by mixing material in proportion as indicated in table 3 of IS:456/2000 (or latest version) shall be used.

(3) Supply & Erection of solid core cut in/suspension/9T feeder insulator:

The price is applicable to the provision of an additional 9 tonne cut-in-insulator on a flat rate basis such as in a head span, cross span or in span wire or an overhead equipment conductor at an insulated overlap, anti-creep not provided for in other items or for suspension of OHE wires or 9T feeder insulator.

The price shall cover supply of all components required for the cut-in insulators assembly, including appropriate terminal fittings for the conductor and the 9-tonne insulator or all components for the suspension assembly. The price shall cover erection of all components, including the 9-tonne insulator [after testing as per RDSO procedure before erection].

(4) Supply & Erection of copper strip 25 mmx3mm for earthing of AT with Mast:

The price shall cover supply and erection of 25 mm x 3 mm copper strips silver paint coated with rivets to connect the earth terminals of LT supply transforms to the main mast on which they are mounted for fixing the copper strips along any structure member.

(5) Supply and Erection of LV Box assembly:

The price shall cover supply and erection of LV box assembly as per RDSO Drg. No. ETI/PSI/ 0310 with its latest version along with complete fitting for mounting on AT structure. It also includes fixing the same on the AT mast including all fasteners.

(6) Drilling of horizontal bore below track by pushing method by suitable means for laying of HDPE / GI pipe of various sizes (In this work 2 cable will be laying which will be separated by each other):

This item covers drilling of Horizontal bore by pushing method or any suitable means acceptable to Railways in all types of soil/rock for laying of HDPE pipe from 75 mm to 450 mm by pushing method in presence of Railway representative taking all necessary safety precautions related track and movement of trains. Horizontal boring will be done at minimum 1.5 Mtr. Below from ground level at railway track portion but in case, where bank height of track is high then boring should be such that outer side and under track HDPE pipes are in same alignment. All work will be done in presence of Railway representatives without disturbing the Railway track taking all necessary safety precautions related to track and movements of trains. Since the bore is to be made at different locations as per crossing tracks, all the transportation, loading & unloading of equipment required for boring shall be done by the contractor at his own cost. If any damage occurred to Railway property while boring, the contractual agencies shall attend the damage on the top priority as per the Railways instruction and the damage charges as fixed by the Railways shall be binding on the contractor.

(7) Supply of DWC HDPE pipe of 120 mm Dia along with all required material for joining the pipe (In this work 2 cable will be laying which will be separated by each other):

The items cover supply of 120 mm OD/103.5 mm ID, Double Walled Corrugated (DWC) HPDE pipe of reputed manufacturer confirming to suitable IS. The contractor shall have to submit a manufacturing test certificate and should be as per latest IS with anti-rodent, antioxidant and non-flammable properties. It also includes the supply of all required material for joining the pipes

(8) Laying of DWC HDPE pipe of 120 mm Dia in the trench (In this work 2 cable will be laying which will be separated by each other):

The work includes the laying of pipe in the trench with a gradient to facilitate drainage of water and should be at right angle to the track. It also includes the supply of all material & their erection for making smooth joints and water tight for the pipe.

(9) Excavation of trench in all kinds of soil & making niche in rocky area for 500 mm wide x 1000 mm deep (In this work 2 cable will be laying which will be separated by each other):

This item covers excavation of trenches in all types of soil and having a width of trench of 50 cm for laying cable. The depth of trench is increased 1 to 1.2 M in case of cable above 1.1 KV as per site requirements. Adequate precaution should be taken not to damage any existing cable, pipe or other such installation in the proposed route during excavation. The bottom of the trench shall be level and free from stones, bricks, bats etc. The trench shall be provided with a layer of clean dry sand cushion of not less than 10cm in depth. After laying of HPDE/GI pipe, the excavated Earth should be filled back duly ramming for consolidation throughout the trench. The contractor shall repair the damaged surface, floor, path way, channels, platform or any other structure to its normal position after laying the cable.

(10) Supply & laying of HDPE pipe of 75/80 mm Dia, wall thickness 3mm. The work involves laying of HDPE pipe (In this work 2 cable will be laying which will be separated by each other):

Supply & fixing/laying of HDPE pipe in trench/under floor/road/railway track etc. or as per site requirement. The diameter of HDPE shall be 75/80 mm and wall thickness shall be 3 mm. It involves laying of cable in the HDPE pipe. It shall be possible to withdraw the cables for repair or replacement without disturbing the Railway work. The pipes shall be laid with a gradient to facilitate drainage of water and it shall be at right angle to the track. As per reputed Make & relevant IS.

(11) Supply & fixing of medium class GI pipe (size 50 mm dia), for cable support on wall/pole with MS flat (25 X 6mm) clamps, fixtures, bushing, nuts, bolts, grommet on each end of pipe. (In this work 2 cable will be laying which will be separated by each other):

The price shall include the supply of medium class or 'B' class ISI marked GI pipe of mentioned diameter. The GI pipe shall be fixed on the wall / pole with MS flat (25x6 mm) clamps, fixtures, bushing, nut, bolts, screws, grommet etc. for each end of the pipe as per site requirement and as per location mentioned by Rly. Engineer.

(12) Laying cable in air / wall / pole with fixture (02 No. per mtrs) (In this work 2 cable will be laying which will be separated by each other):

The contractor shall have to lay cable open in air as per decided by the site Engineer (i.e. pole/wall/Ceiling). Cable should be properly terminated with standard size of lug. The cable along the wall should be provided with a suitable size of M.S. clamps, Reg Bolts / J bolts shall be provided to support the cable. The distance between two supports is not more than 0.50 meters. Breaking of wall to make holes for the contractor shall do cable entry in the building shall be restored to original levels to the satisfactions of the railway. Cable entry in the wall shall be adequately sealed.

(13) Cable laying in loop form in each end (In this work 2 cable will be laying which will be separated by each other):

This involves laying of cable in trench [at the end of trench] on sand bed of 75 mm and covering by sand and bricks; all as provided in case of cable laying in trench

(14) Supply & Fixing of J' type Cable Route Marker made of cast iron as per approved Railway drawing:

(i) The item includes supply and fixing of 'J' type cable route markers made of cast iron as per approved Railway drawing by fixing /grouting along with laying of cables in trenches of all classes of soils.

(ii) The cable route marker shall be provided at every 100 mtr distance approximately and also at the bending /turning point of the cable route. The cable route marker will be J "shape made of MS angel size 25x25x3mm, one meter long with RM plate and shall be available at the site at the time of laying of cable.

(iii) The cable route marker shall be of approved design by Sr. DEE/TRD/BPL before arranging procurement by the contractor. The letters "AT cable" should be engraved on the cable route marker.

(iv) Transportation of material up to the work site with loading/unloading and shifting shall be done by contractor.

(15) Supply and Erection of single pipe Earth Electrode (earthing station):

The price shall cover supply and erection of an earthing station with a single pipe electrode of 50 mm. Dia GI pipe embedded into the ground by driving or otherwise as per relevant IS complete with protective concrete box, its cover and lugs suitable for directly connecting two mild steel flats of minimum size of 40mmx6mm. This includes excavation and provision of charcoal and salt as per site requirement. Price shall also include where an earth electrode is embedded by excavation in a rocky area and extra volume is to be filled with charcoal and salt. It includes necessary size GI earth wire for short distance earth connection. The price shall cover supply and erection of all additional materials required for embedding the earth pipe. The drawing/specification as per ACTM/RDSO/Railway board/CEE shall be followed.

(16) Supply & Erection of Structure Bond:

The price shall cover supply of all materials including mild steel flat 40x6mm 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 M S bond shall be painted one coat of red oxide and two coats of bitumen paint. The price shall also include provision of heat shrinkable PVC tube for structure bond under track circuited rail.

(17) Supply & Erection of Earth Bus (MS flat 50 x 6 mm):

The price shall cover the supply of all materials including 50mmx6mm mild steel flats for providing earth bus. The price shall also cover erection of earth bus either buried at a depth of 300 mm below ground level painted with 2 coats of red oxide zinc chromate primer and 2 finishing coats of bitumen as per the particulars specified in para 2.1.41 or fixed on wooden gutties on walls. It shall include connecting the earth bus to earth electrodes and to various floor or wall mounted equipment or structures to be earthed and also connection to non-track circuited rails, wherever required. It shall also cover the cost of making recesses in concrete foundation blocks or floor or cubicles and covering them up. The connection of earth strips to each other shall be made either by riveting or by welding. The connections

of earth strips to various equipment, structures or fencing posts shall be made with G.I. bolts and nuts and spring washer/lock nuts.

(18) Supply and Erection of anti-climbing devices:

The price shall include the supply of galvanized anti-climbing device including galvanized barbed wire and fixing it to the structure with the help of clamps made of GI flat of size 40 X 6 mm and fixing with suitable GI nuts, bolts below AT.

(19) Supply and Erection of Caution board, unwired board, engine stop board, Sigma board etc. and other similar board:

The price shall cover the supply of unwired board, Engine stop board, power block working limit board, caution board, Sigma board in specified numbers confirming to latest RDSO specification / Drawing and erection of the same on structures as per site requirement of purchaser using proper clamps, nut bolts etc. required for erection at specified locations which are not covered in any other item. The locations shall be identified by the Rly Engineer as per latest guidelines of RDSO/Railway Board etc.

(20) Provision of Retro Reflective Number Plate:

- (a) The price shall cover the cost of supply and erection of retro-reflective structure number plates including steel bolts, nut and lock nuts etc.
- (b) The retro-reflective number plates shall be supplied as per RDSO specification no. ETI/OHE/33A (12/97) or latest.
- (c) The colour configuration size and all other requirements of structure number plates shall be in accordance with RDSO's drawing. No. ETI/OHE/P/7503 or latest. The numerals /letters shall be reflectorized using retro-reflective sheeting of encapsulated lens category. The erection of the retro-reflective number plates on structures as per requirement of consignee using proper clamps as per RDSO's drawings of different types of mast and portals.
- (d) Stainless steel nut, bolts and lock nut shall be used for fixing the retro-reflective type number plates as per RDSO Drg no. ETI/C/0073 mod E or latest. The bolts shall be suitable for 12mm Dia holes. The size of bolts shall be 10 mm. Dia x35mm/30mm with nut and spring washer. All fasteners shall be as per IS-4218. Nut shall be tight with lock tight material. Fasteners shall have ISO metric threads.

(21) Supply and Erection of cable termination along with lugs, clamps, fixtures, glands etc. for LT cable (Each set contains piece for both the ends of cable):

It includes the supply or necessary lugs/termination/jointing kit of appropriate sizes, required for connection of cables at both the ends. It also includes the supply of necessary glands of appropriate size for cable termination. The cable shall be properly lugged with the help of a crimping tool and the terminal shall be properly tight. Necessary tools/plants required for the work shall be supplied by the contractor.

(22) Supply, Erection, oil filtration, Testing and Commissioning of LT supply transformer 25 KVA of 25 KV/230 V with DO fuse switch assembly & copper Jumper etc.:

The price shall cover supply, erection, testing and commissioning of 25 KVA of 25 KV / 230 V LT supply transformer complete with all fittings and accessories including terminal connectors as per RDSO specification No. ETI/PSI/15 (8/2003) or latest version, on the mast/ gantry. This price shall also include supply of copper jumper wire (65 sq mm) of suitable length along with PG clamp, suspension clamp (RI-1160), single clevis (RI-1270) with other associated fittings necessary for Jumper connection between OHE, DO and AT HT terminal as per Drawing No. RE/42/CG/05521. The price shall also cover supply of EHV grade insulating oil as per relevant RDSO specification. The work also includes the oil filtration and pre commissioning tests as approved by the Railways. The contractor shall make his own arrangement for oil filtration equipment, as well as power supply required for the same. All necessary tools, equipment, instruments required to carry out oil filtration / checks/tests/ commissioning shall be arranged by the contractor. The price shall also include the transportation cost of AT required site by his own arrangements.

Note: The replacement/Top up of the transformer oil on account of testing and leakages during the warrantee period shall be done by the contractor at his own cost.

(23) Supply, fixing, testing and commissioning of automatic auto change over control and distribution panels for 150 Amp. (for 25KVA AT) & 60 Amp. (for 10KVA AT) Capacity as per RDSO specification. No. TI/ SPC/ PSI/ CLS/ 0025 or latest:

The CLS panel suitable for 150 Amps & 60 Amp for automatic changeover of supply, suitable for transformer output as per RDSO specification, shall be supplied and pre-checked by the Railway Site Engineer before erection. All tools & testing kit shall be provided by the contractor for conducting the required tests as per Rly. norms. The CLS panel shall be fixed at the site as specified by the Rly. Site Engineer with proper fixtures as per site requirement, necessary clamps, nut bolts, MS angle frame, etc. shall be used for fixing the panel as per site requirement.

(24) Supply of 2 core 70 sq. mm (for 10KVA AT) and 2 core 150 sq. mm (for 25KVA AT), XLPE armored aluminum cable as per relevant IS: The price shall cover supply of 2×150 sq mm & 2×70 sq. mm ISI marked Cross-Linked Poly Ethylene (XLPE) insulated, PVC outer sheathed, armored with galvanized round steel wire or steel strip cable with aluminum conductor, Suitable for rated voltage of 1100 volts, Conforming to IS 7098 (Part-1): 1988 with amendment no. 1, 2 and reaffirmed 2005 or latest.

(25) Laying, testing and commissioning of LT XLPE cable (2 core 70 sq. mm and 2×150 Sq mm) in the cable trench, DWC pipe, GI pipe etc. (In this work 2 cables will be laying which will be separated by each other): This involves excavation of a 1000 mm deep trench in soil/hard murum/tar road/below Railway track. Then the bottom of the trench should be leveled, freed from stones/sharp edges of rocks. Then lay a bed of 75mm thick fine sand at the bottom of the trench. After this the cable shall be laid and then both sides are to be covered with 'B' grade bricks, thereafter sand to be filled on the cable by a 75mm thick layer followed by the final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth and to be matched as per surrounding surface. The contractor has to collect the Cable from the Railway depot at his own cost.

Whenever and wherever clamps & glands (brass cable glands) are required then they shall be shaped to accommodate the 'cable' and should be painted with two coats of red oxide and two coats of paint matching with general décor/surrounding surface

(26) Supply of Lightning arrestor with disconnecter assembly and surge monitor:

The price shall cover supply, erection, alignment & connecting, testing and commissioning of lightning arrestor with disconnecter assembly and surge monitor complete with all accessories required for its smooth and trouble-free operation. The equipment shall conform to the latest RDSO specification. It shall also include mounting and connecting up of the Lightning Arrestor in position and supply and erection of an enameled number plate.

(27) The price shall cover Supply, digging and erection of pucca trench in rocky/ platform/ tone/under road etc. of 500 mm deep and 350 mm wide. Replastering the platform after laying of cable.

(28) Dismantling of existing AT with all associated equipment, panel etc.:

The price shall cover the cost of dismantling the existing AT with all equipment, panel etc. completely including dismantling of all arrangements as per approved manner or as directed by site engineer and the same shall be handed over to Rlys.

(29) Handling, loading, unloading and transportation of new/ released OHE structure AT with all associated equipment, panel, from different railway site to concerned TRD depot:

The prices should include leading, loading, unloading and transportation of dismantled and other material from the proposed site to Bhopal Rly Depot or else by contractor's own trailer / truck / road vehicle. It also includes insurance and other charges. It also includes the cost required towards the machine and plant for unloading /loading of material. It should be ensured that during loading, transit, unloading etc. any damage to the railway material or railway property shall be charged on the contractor

through necessary debit / recovery as per Rly Rules / condition. The price shall include transportation of released material from site to location where the work is to be executed. This item covers handling charges of only that material which are not covered by other scheduled items.

Annexures

List of Signalling IRS specifications

Annexure-I

S. No.	Specification No.	Description of Item
1	<u>IRS:S 30-64</u>	Key lock 'E' type
2	<u>IRS:S 31-80</u>	DC polarized relay-3 position
3	<u>IRS:S 40-84</u>	Nylon insulated joints-Nylon components
4	<u>IRS:S 63-2014 Rev.4</u>	PVC insulated underground unscreened cables for Railway Signalling
5	<u>IRS:S 65-83</u>	Choke coil for single rail track circuit on 25 KV, 50 Hz AC electrified section (B-Type Choke)
6	<u>IRS:S 66-84</u>	Route indicator, direction type 5 lamp unit arm (1 to 6 way)
7	<u>IRS:S 67-85 Amdt.3</u>	Silver Impregnated Graphite Contacts for Railway Signalling Relays
8	<u>IRS:S 76-89</u>	PVC insulated indoor cables for Railway Signalling
9	<u>IRS:S 78-2006</u>	Non deteriorating type of low voltage electric fuses for Railway Signaling
10	<u>IRS:S 80-92</u>	Indicating type of low voltage non-deteriorating fuse links for signalling circuits
11	<u>IRS:S 88-2004</u>	Low maintenance Lead acid stationary secondary cells
12	<u>IRS:89/2025 Ver 2.0</u>	Track feed battery charger
13	<u>IRS:S 93-96</u>	Valve Regulated (Sealed) Lead Acid Stationary Battery & Charger for Railway S&T Installations
14	<u>IRS:S: 99/2006 Ver. 1.0</u>	Data Logger System for Railway S&T Installation
15	<u>IRS:S:104/2012 Ver. 0</u>	Universal Fail-safe Block Interface (UFSBI)
16	<u>IRS:S-105/2025 Ver. 1.0</u>	Block Proving by Axle Counter using UFSBI (BPAC)

Note: Any specification not covered in the above table can be accessed from RDSO website.

List of Signalling RDSO specifications**Annexure-II**

S. No.	Specification No.	Description
1	<u>RDSO/SPN/84 Ver. 2.0 Amdt. 1</u>	Miniature, Tractive Armature, A.C. Immune, D.C. Biased Track Relay, Plug in Type for Railway Signalling Purposes, Style 'QBAT', 9 ohms
2	<u>RDSO/SPN/144/2006 Rev. 2</u>	Safety and Reliability Requirement of Electronic Signalling Equipment
3	<u>RDSO/SPN/151/1997</u>	FRP Material for Signalling Equipment
4	<u>RDSO/SPN/153/2023 Rev. 5.0</u>	Specification for LED Signal Lighting Units for Subsidiary Colour Light Signals (Route, Shunt, Calling on and Tunnel Signals) For Railway Signalling
5	<u>RDSO/SPN/165/2023 Ver. 4.0 Amdt. 1</u>	SMPS Based Integrated Power Supply
6	<u>RDSO/SPN/173/2002 Amdt. 2</u>	Fail Safe Electronic Flasher Device for Railway Signalling
7	<u>RDSO/SPN/176/2013 Ver. 3.0</u>	Multi Section Digital Axle Counter
8	<u>RDSO/SPN/177/2012 Ver. 3.0</u>	Single Section Digital Axle Counter
9	<u>RDSO/SPN/184/2004</u>	Non-corrosive NFTC apparatus case for Railway Signaling.
10	<u>RDSO/SPN/189/2004 Ver.3</u>	Modular Terminal Blocks, Fuse Terminal Blocks & Miniature Fuse Links of International Standard for Railway Signalling
11	<u>RDSO/SPN/192/2019 Ver. 2</u>	Electronic Interlocking
12	<u>RDSO/SPN/194/2006 Rev.2.0</u>	Non-Metallic Colour Light Signal Housings of Various Types for Railway Signalling.
13	<u>RDSO/SPN/197 Ver. 1.0</u>	Code of practice for Earthing & Bonding system for signaling equipment.
14	<u>RDSO/SPN/199/2025 Rev. 1.2 with Amendment 1</u>	LED Signal Lamps for Main Colour Light Signals (Integrated) for Railway Signalling
15	<u>RDSO/SPN/204/2011/Ver. 1.1 Amdt. 1</u>	Double Walled Corrugated HDPE Duct for Railway Signalling
16	<u>RDSO/SPN/208/2012/Ver.2.0 Amdt. 1</u>	Electric Lifting Barrier
17	<u>RDSO/SPN/209/2012 Ver.2.0</u>	Fuse Auto Changeover System (FACS)
18	<u>RDSO/SPN/217/2025 Ver.3.1</u>	Automatic Fire Detection and Alarm System for Signalling & Telecom Installations
19	<u>RDSO/SPN/219/2016 Ver 1.0 Amdt. 1</u>	Key Lock Checking Relay with D.C Neutral Relay (A.C. Immunized/ Non A.C. Immunized)
20	<u>RDSO/SPN/256/2025 Version: 2.0</u>	Earth Leakage Detection and Earth Fault Localization System

Note: Any specification not covered in the above table can be accessed from the RDSO website.

List of Telecommunication IRS specifications**Annexure-III**

S. No.	Specification No.	Description
1	IRS:TC:22-2021 Ver. 1.1	V.F. and Signalling Transformers used for derivation and Termination of Underground Telecommunication Cable Circuits.
2	IRS:TC 30-05 Amdt. 5	Underground Rly Jelly filled quad cables for Signalling and Telecom Installation.
3	IRS:TC-41/97	Supply of PIJF telephone cable 20 pairs, 0.63mm dia. Copper conductor armored
4	IRS: TC-55/2006 Ver 1.0	24 Fiber Armoured OFC Cable
5	IRS:TC: 60-2007	4 Wire/ 2 Wire train traffic control equipment with Dual Tone Multi Frequency (DTMF) Signalling.
6	IRS:TC: 68-2012 Amdt. 1	Primary Digital Multiplexing Equipment.
7	IRS:TC: 72-97	Power supply unit (PSU) for Telecom Installation at wayside stations in 25 KV Electrified Area.
8	IRS:TC: 76-2021	Two/Three V.F. Transformers (2T/3T) for derivation and termination of underground telecom cable circuit
9	IRS:TC: 77-2012 Amdt. 3	Thermo shrink jointing kits for jointing underground quad cable.

Note: Any specification not covered in the above table can be accessed from the RDSO website.

List of Telecommunication RDSO Specifications**Annexure-IV**

S. No.	Specification No.	Description
1	RDSO/SPN/TL/23/1999 Ver.4 Amdt. 1	SMPS based power plant for telecom equipment.
2	RDSO/SPN/TC/45/2013 Rev. 2.0 with Amendment 3.0	Permanently Lubricated HDPE Duct
3	RDSO/SPN/TC/49/2020 Ver. 1.0	Level crossing gate control and monitoring equipment based on wired & wireless (VHF) communication
4	RDSO/SPN/TC/66/2007 Ver. 1.0	Control Communication Equipment for OFC using 2 wire Telephones (CCEO)
5	RDSO/SPN/TC/68/2014 Amdt. 1	Joint enclosure for Armoured optical fiber cable
6	RDSO/SPN/TC/69/2007 Rev.0	Patch cord and pig tails
7	RDSO/SPN/TC/73/2008 Rev.0	VHF based secured communication equipment
8	RDSO/SPN/TC/80/2020 Rev. 2.0	Digital Modem (nx64Kbps) up to 2Mbps (Line Driver)
9	RDSO/SPN/TC/82/2020 Rev. 2.0	LAN Extender
10	RDSO/SPN/TC/83/2020 Rev. 2.1	LAN Switch
11	RDSO/SPN/TC/84/2008 Rev.0	Router
12	RDSO/SPN/TC/98/2011 Amdt. 1	Surge Protective Devices for Telecommunication equipment
13	RDSO/SPN/TC/103/2013 Rev.2	Managed Media Converter (Ethernet/E1 to Optical)
14	RDSO/SPN/TC/107/2018 Ver.- 2.1	VHF Sets to be used on Indian Railways
15	RDSO/SPN/TC/110/2020 Rev. 0	48 Fiber Armoured Optical Fiber Cable
16	RDSO/SPN/TC/37/2020 Revision- 4.0 or latest	FDMS

Note: Any specification not covered in the above table can be accessed from the RDSO website.

Other Specifications**Annexure-V**

S. No.	Description	Specification/Drawing
1.	Location Box Full foundation	Drg No IRSEM Appendix II 19-D1
2.	Location Box Half foundation	Drg No IRSEM Appendix II 19-D2
3.	Main Signal Foundation	Drg No IRSEM Appendix II 19-D3
4.	Shunt Signal Foundation	Drg No IRSEM Appendix II 19-D4
5.	E Type Lock & Key	SA 3376/M & S 3377 or latest
6.	RCC Cable Marker	Drg No IRSEM Appendix II 15-D1
7.	Arrow Board for RHS Signals	Drg No IRSEM Appendix II 19-D10
8.	Signal Number Plate	Drg No IRSEM Appendix II 19-D10
9.	C Marker	Drg No IRSEM Appendix II 19-D10
10.	G Marker	Drg No IRSEM Appendix II 19-D10
11.	CLS with Route Indicator	Drg No IRSEM Appendix II 22-D5
12.	Crank handle box	Drg No CHB/RST/C/BPL/114
13.	Cable laying rocky	Drg No IRSEM Appendix II 15-D2
14.	Track lead	Drg No IRSEM Appendix II 17-D1
15.	Earthing for Signal	Drg No IRSEM Appendix II 19-D6
16.	Earthing Electrode MF	Drg No IRSEM Appendix II 19-D5
17.	Full location wiring	Drg No IRSEM Appendix II 19-D8
18.	Goods warning board	Drg No IRSEM Appendix II 12-D1
19.	VDU Table for EI	Drg No IRSEM Appendix II 21-D5
20.	Lifting barrier foundation	Drg No. Dy. CSTE/C/BPL/012
21.	GI Bend pipe for Point machine	Drg No. Dy. CSTE/C/BPL/011
22.	GI Pipe	IS.1239 (part-I) 1990
23.	Hylam Sheet	IS 2036- 1995 or latest

Specification for Fault diagnostic for Data Logger & MSDAC Annexure-VI

Brand	Lenovo Idea Centre AIO 3i 68.58cms - 13th Gen Intel Core™ i5-13420H Processor (E-cores up to 3.40 GHz P-cores up to 4.60 GHz) (White) or similar
Colour	White
Form Factor	All-in-One
Standing screen display size	27 Inches
Resolution	1920x1080 Pixels
RAM Size	16 GB DDR4-3200MHz (SODIMM)
Hard Drive Size	1 TB SSD M.2 2280 PCIe Gen4 TLC
Graphics Card	Integrated Intel® UHD Graphics for 13th Gen Intel® Processors
Connectivity Type	Wi-Fi 6 2x2 AX & Bluetooth® 5.1 or above
Number of USB 2.0 Ports	2
Number of USB 3.0 Ports	2
Number of HDMI Ports	1
Operating System	Windows 11 Home Single Language 64
Camera	5MP IR
Are Batteries Included	Yes
Included Components	User Manual, Wireless Keyboard, Power Cable, Wireless Mouse, All in One (AIO)
Warranty	1 Year On-site
Computer Table	1 No.

Technical Details for Printer

Model	Epson Eco Tank L3210 A4 All-in-One Ink Tank Printer (Print, Scan, Copy) or similar
Resolution	Print resolution - 5760 x 1440
Page Size Supported	A4
Special Feature	Refillable Ink Tank
Printing Technology	Ink tank
Maximum Print Speed (Colour)	17 ppm
Max Print speed Monochrome	26 ppm

Scope for supply of Spare material**Annexure-VII**

S. No.	Item	Quantity
1	Electronics Interlocking	10% for all cards/modules/components/relays/parts including power modules, patch cords, switches etc. shall be provided for each station. For calculation for the case of fractions, the next higher integer value shall be taken.
2	LC Gate	As mentioned in the latest RDSO Specification.
3	Batteries	10% for Track Circuit Batteries.
4	Fire detection and alarm system	As mentioned in the latest RDSO Specification.
5	All types of Relays, Signal LEDs and KLCR.	10% of the quantity utilized
6	ELD, Fuse-Auto Changeover System (FACS)	10% for all electronics/electrical cards/modules/components
7	MSDAC cards (Frausher make): serial cards, parallel cards, power supply module cards and CPU cards.	1 No. of each card at each station.
8	Double rail contact assembly with track side EJB/EAK for MSDAC (each set shall consist of track side electronic unit, Double rail contact with cable and mounting accessories), Double rail contact (TX coil & Rx coil) as per RDSO Spec. No. RDSO/SPN/176/2013 with latest amendment. (Frausher make)	<p>1 Set of Double rail contact assembly with track side EJB/EAK for MSDAC (each set shall consist of Double rail contact with cable and mounting accessories at each station i.e. SGBJ, CKKD, CAER, BARUD, DRHI & ET 'B'.</p> <p>1 Set of Double rail contact (TX coil & Rx coil) at each station i.e. SGBJ, CKKD, CAER, BARUD, DRHI & ET 'B'.</p> <p>2 Set of Double rail contact assembly with track side EJB/EAK for MSDAC (each set shall consist of Double rail contact with cable and mounting accessories, Double rail contact (TX coil & Rx coil) for BIR station.</p> <p>2 Set of Double rail contact (TX coil & Rx coil) for BIR station.</p>

Technical Details for PC workstation**Annexure-VIII**

Brand	Lenovo Idea Centre AIO 3i 68.58cms - 13th Gen Intel Core™ i5-13420H Processor (E-cores up to 3.40 GHz P-cores up to 4.60 GHz) (White) or similar
Colour	White
Form Factor	All-in-One
Standing screen display size	27 Inches
Resolution	1920x1080 Pixels
RAM Size	16 GB DDR4-3200MHz (SODIMM)
Hard Drive Size	1 TB SSD M.2 2280 PCIe Gen4 TLC
Graphics Card	Integrated Intel® UHD Graphics for 13th Gen Intel® Processors
Connectivity Type	Wi-Fi 6 2x2 AX & Bluetooth® 5.1 or above
Number of USB 2.0 Ports	2
Number of USB 3.0 Ports	2
Number of HDMI Ports	1
Operating System	Windows 11 Home Single Language 64
Camera	5MP IR
Are Batteries Included	Yes
Included Components	User Manual, Wireless Keyboard, Power Cable, Wireless Mouse, All in One (AIO)
Warranty	1 Year On-site warranty
Computer Table	1 No.

Technical Details for A3 Colour Printer & Scanner

Brand	Epson or similar
Series	L1455 or similar
Colour	Black or similar
Connectivity Type	Wi-Fi
Included Components	All-In-One Colour Inkjet Printer with Ink Tank (Black)

IPS distribution**Annexure-IX**

SMPS based IPS for EI at stations				
AC Distribution Panel				
S. No.	Modules	Rating	Quantity	Purpose
1	AVR	3 KVA	4	For Track circuit North, Track circuit South, Signal North and Signal South
2	Inverter	3 KVA	4	For Signal North and Signal South
3	SMR	110V/20A	5+1 (Cold Stand by)	As per standard practice
4	TXR	230/110V, 1000 VA	7	For Track circuit, Signal North, Signal South & LC gate
DC Distribution Panel				
S. No.	Modules	Rating	Quantity	Purpose
1.	DC-DC convertor	12-28 V/5A	2	HKT & Magneto
2.	DC-DC convertor	3-6V/0.1A	2	Block Telephone
3.	DC-DC convertor	24-32 V/10A	2	UFSBI North
4.	DC-DC convertor	24-32 V/10A	2	UFSBI South
5.	DC-DC convertor	24-32 V/10A	2	UFSBI IBS working
6.	DC-DC convertor	24-32 V/10A	2	EI FAN
7.	DC-DC convertor	24-32 V/10A	2	BPAC DP (N) Main
8.	DC-DC convertor	24-32 V/10A	2	BPAC DP (N) Stand By
9.	DC-DC convertor	24-32 V/10A	2	BPAC DP (S) Main
10.	DC-DC convertor	24-32 V/10A	2	BPAC DP (S) Stand By
11.	DC-DC convertor	24-40 V/10A	4	ACE/DP North
12.	DC-DC convertor	24-40 V/10A	4	ACE/DP South
13.	DC-DC convertor	24-40 V/10A	2	TPR External North
14.	DC-DC convertor	24-40 V/10A	2	TPR External South
15.	DC-DC convertor	24-32 V/10A	2	Data Logger
16.	DC-DC convertor	24-40 V/10A	2	Point Detection North
17.	DC-DC convertor	24-40 V/10A	2	Point Detection South
18.	DC-DC convertor	24-32 V/10A	4	Relay Internal
19.	DC-DC convertor	24-40 V/10A	2	Relay External North
20.	DC-DC convertor	24-40 V/10A	2	Relay External South
21.	DC-DC convertor	24-40 V/10A	2	Fire alarm System
22.	DC-DC convertor	24-40 V/10A	2	KLCR
23.	DC-DC convertor	2-12 V/5A	3	SP Cell
FUSE TERMINATION				
1.	KAVACH (TCAS)	110V DC/5A	(1+1) No. configuration	-
2.	VDU-1	110V DC/10A	1 No.	-
3.	VDU-2	110V DC/10A	1 No.	-
4.	MAINTENANCE TERMINAL	110V DC/10A	1 No.	-
5.	EI	110V DC/20A	(1+1) No. configuration	-
6.	POINT MACHINE	110V DC/20A	1 No.	-
7.	RDPMS	110V DC/10A	1 No.	-

NOTE:

1. The firm has to supply One Set of VRLA batteries each of rating 2V/300AH as per RDSO specification apart from above break-up.
2. The firm has to supply 1 No. additional SMR of 110V DC/20A rating apart from the above break-up.
3. The firm has to supply spare modules as per Annexure-IV. of RDSO specification apart from above break-up.
4. The firm has to supply a tool kit as per Annexure-I of RDSO specification apart from the above break-up.

SECTION-V: GENERAL REQUIREMENTS

- 5.0** All associated materials and works for completion not limited to items in the above table as required for execution of the signalling works to suit 25 KV has to be provided by the Contractor.
- 5.1** The work shall be carried out according to the drawings approved by the Railway and shall conform to the provisions of the “Indian Railways Signal Engineering Manual” and “Indian Railways Schedule of Dimensions” as modified from time to time unless deviations, if any, are specifically approved by the Authority Engineer. The contractor shall be solely responsible for proper execution of the work as per the said deviation and specifications.
- 5.2** No work on a working installation, e.g. signal, track circuit etc. should be undertaken without permission and presence of authorized representative of the Authority Engineer.
- 5.3** All materials and equipment to be supplied and used in execution of the work should conform to IRS/IS/RDSO specification, as applicable, with latest amendments wherever applicable.
- 5.4** All drawings/specifications shall be read with latest alterations.
- 5.5** All the test reports shall be signed by the contractor’s Engineer.
- 5.6** The Contractor shall transport all the released materials to railway depots nominated by the Authority’s Engineer.
- 5.7** All the materials required for execution and successful completion of this work shall be supplied and installed by the contractor unless specified otherwise and specifically mentioned.
- 5.8** On completion of above works, testing and commissioning of the entire system in totality shall be carried out by the Contractor.
- 5.9** Painting color scheme of newly installed signal posts and fittings, apparatus cases etc. shall be as per provisions of IRSEM.

*****End of Report****