

MINISTRY OF RAILWAYS
WEST CENTRAL RAILWAY

Feasibility Report

Survey, design, supply, installation, testing and commissioning of trackside KAVACH (Indian Railway Automatic Train Protection System) equipments at stations/LC Gates/IBS locations including OFC works, erection of towers and associated Civil/Track/Electrical works required for KAVACH in ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI-MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN section of Jabalpur Division of West Central Railway

on

Engineering, Procurement & Construction (EPC)

SIGNAL & TELECOMMUNICATION DEPARTMENT

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SECTION-I:

1.0 Introduction:

Kavach is an automatic train protection (ATP) system indigenously developed by Indian Railways through Research Designs & Standards Organization (RDSO). Initial development of Kavach started in 2012 under the name Train Collision Avoidance System (TCAS) and completed development in 2022. Kavach has been certified for compliance with safety integrity level 4 (SIL-4) operation.

RDSO has developed KAVACH, as Indian Railway Automatic Train Protection system (IRATP) which has Cab Signalling features-useful for high speeds as well as foggy weather.

- Prevention of SPAD.
- Cab-Signaling, Loop Line Speed Control.
- Prevention of over speed: Section Speed, Train Speed, Permanent Speed Restriction (PSR).
- Protection of Roll back and Reverse movements.
- Prevention of Side-collision in the block section.
- Prevention of Head-on & Rear end collisions.
- LC Gate Automatic Warning.
- Save Our Souls (SOS) Messages.
- Computation of Train Length.
- Centralized live monitoring of Train movements in Networking Management System (NMS)

Operational Functions of KAVACH

Location of train: Loco KAVACH unit determines the location of train by reading pre-programmed RFID Tag data

- Direction of movement of train shall be determined, when Loco/Train has passed two RFID tags sequentially.
- Movement Authority: Stationary KAVACH unit shall calculate the movement authority based on the signal aspect or/and track circuit status or/and route locking status, point position and transmit the Movement Authority to the Loco KAVACH.
- Train Length Assignment: Based on the time of occupation and clear status of track sections (identified for measurement of train length), communicated by Stationary KAVACH unit, Loco KAVACH unit shall calculate its train length.
- Prevention of SPAD: In case of any conflict the Stationary KAVACH unit shall transmit the most restrictive aspect of that signal and shall reduce the movement authority accordingly.
- Automatic application of Brakes:
 - a) If a loco pilot fails to stop the train.
 - b) If two trains are detected by Stationary KAVACH to be moving towards each other on the same TIN. (Prevention of Head on Collision)

1.1 General Description and objective of the project:

ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI-MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN section spread over Approx. 1067 RKM of Indian Railways passes through Madhya Pradesh and Uttar Pradesh and deals with substantial originating, terminating and cross traffic. The entire section is covered by a number of large, medium and small-scale industries and is one of the busiest routes of IR which connects national capital New Delhi to Mumbai, Chennai, capital of Tamil Nadu. The route passes through industrialized belts and there is high demand in all categories of trains across all service categories including premium segments.

There are total 109 stations and 143 LCs, 46 IBH and 01 ABS hut in the section. The various benefits of KAVACH system are as follows:

- i. Reduction in travel time
- ii. Improved Safety & Security
- iii. Increased throughput
- iv. Removal of mismatch between existing Speed potential of the rolling stock and fixed infrastructure.

1.2 PROJECT DESCRIPTION:

Survey, design, supply, installation, testing and commissioning of trackside KAVACH (Indian Railway Automatic Train Protection System) equipments at stations/LC Gates/IBS locations including OFC works, erection of towers and associated Civil/Track/Electrical works required for KAVACH in ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI-MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN section of Jabalpur Division of West Central Railway.

1. Salient feature:

The route length of the Railway Project is described below:

Railway	West Central Railway
Name of Division	JABALPUR
Name of Section	ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI-MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN section of Jabalpur Division of West Central Railway.
Max. Permissible Speed	110 KMPH(ET-JBP-MKP), 110 KMPH(BINA-KTE), 100 KMPH NKJ-KMZ 90-110 (KTE-SGRL) 110 KMPH (STA-REWA) 3rd line (BINA-KTE): 110 KMPH
Number of Lines	Double line (ET-JBP-KTE-MKP), Single Line (BNSP-OHAN, KMA-SAGM) Third Line (NMWP-GEA, BNU-ANA, PHA-GAJ, GAJ-GW, GW-MAKR) Double Line (KMZ-NWMP, GEA-BNU, ANA-PHA) Double line (NKJ-BEHR, JOBA-SGRL), Single

	Line (BEHR-JOBA) Double Line (STA-HNM, TZR-REWA), Single Line (HNM-TZR)
System of Block working	Absolute Block: (ET-KTE, KTE-MKP, KTE-BINA, KTE-SGRL, STA-REWA) Automatic Signalling Section: Bina Malkhedi-Baghora
Railway	West Central Railway
Name of Division	JABALPUR
Name of Section	ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI-MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN section of Jabalpur Division of West Central Railway.
Max. Permissible Speed	110 KMPH(ET-JBP-MKP), 110 KMPH(BINA-KTE), 100 KMPH NKJ-KMZ 90-110 (KTE-SGRL) 110 KMPH (STA-REWA) 3 rd line (BINA-KTE):110 KMPH
Number of Lines	Double line (ET-JBP-KTE-MKP), Single Line (BNSP-OHAN, KMA-SAGM) Third Line (NMWP-GEA, BNU-ANA, PHA-GAJ, GAJ-GW, GW-MAKR) Double Line (KMZ-NWMP, GEA-BNU, ANA-PHA) Double line (NKJ-BEHR, JOBA-SGRL), Single Line (BEHR-JOBA) Double Line (STA-HNM, TZR-REWA), Single Line (HNM-TZR)
System of Block working	Absolute Block: (ET-KTE, KTE-MKP, KTE-BINA, KTE-SGRL, STA-REWA) Automatic Signalling Section: Bina Malkheri-Baghora

2. Route Length

The route length of the Railway Project comprises the section as described below:

SN	Name of location From	Name of location To	Start (km)	End (km)	Length (km)	Remarks
1	ET	JBP	754.13	990.285	236.1	
2	JBP	KTE	990.28	1081.07	90.78	
3	KTE	MKP	1081.0	1257.07	176.0	
4	MAKR	KTE	979.74	1237.96	258.2	

5	KMA	SGMA	1185.1	1185.92	3.863	Single Line
6	KTE	SGRL	1081.0	1341.12	260.05	
7	STA	REWA	1179.2	1228.67	49.400	
8	BNSP	OHAN	1253.2	-	5.48	Single Line
9	MAKR	MDVK	979.74	-	7.11	
10	MAKR	AGD	979.74	-	7.30	
11	Entire Katni Complex					
Note: KMs have been taken from Latest approved SIPs.						

3 a. Core Land

The Site of the Railway Project comprises the land described below:

SN	Name of location From	Name of location To	Start (km)	End (km)	Land Width (Mtr) Approx.
1	ET	JBP	754.130	990.285	30
2	JBP	KTE	990.285	1081.07	
3	KTE	MKP	1081.07	1257.07	
4	MAKR	KTE	979.745	1237.96	
5	KMA	SGMA	1185.18	1185.92	
6	KTE	SGRL	1081.07	1341.12	
7	STA	REWA	1179.27	1228.67	
8	BNSP	OHAN	1253.27	-	
9	MAKR	MDVK	979.745	-	
10	MAKR	AGD	979.745	-	
11	Entire Katni Complex			-	

3 b. Non-Core Land

The non-core land will be available in ET-KTE, KTE-MKP, KTE-BINA, KTE-SGRL, STA-REWA, KMA-SAGMA, BNSP-OHAN sections and entire Katni Complex.

4. Details of Existing Structures:

4.1. **Permanent Way:** Details of the Permanent Way on the Right of Way are:

NAME OF LOCATION FORM	NAME OF LOCATION TO	REMARK	
ET	JBP		DOUBLE LINE
JBP	KTE		DOUBLE LINE
KTE	MKP		DOUBLE LINE
MAKR	KTE	KMZ-NMWP	FLYOVER
		NMWP-GEA	3 rd LINE

NAME OF LOCATION FORM	NAME OF LOCATION TO	REMARK	
		BNU-ANA	
		PHA-GAJ, GAJ-GW	
		GW-MAKR	
		ANA-PHA, GEA-BNU	Double Line
		BJQ-MAKR	Automatic
KMA	SAGM	KMA-SAGM	SINGLE LINE
KTE	SGRL	KTE-BEHR & JOBA-SGRL	DOUBLE LINE
		BEHR-JOBA	SINGLE LINE
STA	REWA	SATNA (STA)-HINAUTA RAMBAN (HNM) & TURKI (TZR)-REWA	DOUBLE LINE
		HINAUTA RAMBAN (HNM)- TURKI (TZR)	SINGLE LINE
KTES	NKJ-A	Continuous track section with slot working	DOUBLE LINE
KTES	KMZ	Continuous track section with slot working	DOUBLE LINE
KTES	KTE	Continuous track section with slot working	DOUBLE LINE
KMZ	NKJ-A	Continuous track section with slot working	Double Line
BNSP	OHAN	OHAN in Jhansi Division of NCR	Single Line
MAKR	MDVK	MDVK in BPL division of WCR	DOUBLE LINE
MAKR	AGD	AGD in Jhansi division of NCR	DOUBLE LINE

Note: 3rd line work has been commissioned in GEA-BNU and ANA-PHA sections but CRS inspection is pending.

4.2. Important Bridges: Refer Engineering Annexure-11A

4.3 Major Bridges: Refer Engineering Annexure-11B

4.4. Minor Bridges/Culvert: Refer Engineering Annexure-11C

4.5. Tunnels: Refer Engineering Annexure-11D

4.6. Railway Flyovers: Refer Engineering Annexure-11E.

4.7. Road Under-Bridges (RUB)/ Road Over-Bridges (ROB): Refer Engineering Annexure-11F

4.8 Railway Level Crossings (LCs): Refer Engineering Annexure-11G & Annexure-12A.

4.9 Railway Stations on Railway Project:

S N	Station Code	Station Name	Central Line (Km No.) Approx.	Standard of Interlocking	Type of Interlocking	Make of Interlocking	No. of Routes	No. of Lines	Junction or Not
Itarsi-Manikpur (ex) section									
1	ET	Itarsi	745.130	Std-I	RRI (Metal to Metal)	Siemens	628	12	Yes
2	GRO	Gurra	755.97	Std-II	PI (Metal to Metal)	Siemens	29	4	No
3	SQL	Sontalai	764.815	Std-IIR	PI (Metal to Metal)	Siemens	24	4	No
4	BGTA	Bagratwa	771.686	Std-IIR	PI (Metal to Metal)	Siemens	26	4	No
5	GMD	Guramkhedi	784.826	Std-II	PI (Metal to Metal)	Siemens	30	4	No
6	SGP	Sohagpur	794.69	Std-IIR	PI (Metal to Metal)	Siemens	35	4	No
7	PPI	Piparia	812.46	Std-II	PI (Metal to Metal)	Siemens	55	5	No
8	BKH	Bankhedi	831.26	Std-II	PI (Metal to Metal)	Siemens	26	4	No
9	SCKR	Salichauka Road	847.99	Std-IIR	PI (Metal to Metal)	ABB	33	4	No
10	GAR	Gadarwara	861.96	Std-II	PI (Metal to Metal)	Siemens	36	5	No
11	BNJH	Baranjh	870.28	Std-II	EI	SIEMENS	228	8	Yes
12	BNE	Bohani	874.76	Std-II	PI (Metal to Metal)	ABB	28	4	No
13	KY	Kareli	890.45	Std-II	PI (Metal to Metal)	ABB	34	4	No
14	NU	Narsinghpur	906.22	Std-IIR	PI (Metal to Metal)	Siemens	43	4	No
15	GPC	Ghat Pindrai	911.95	Std-IIR	PI (Metal to Metal)	Siemens	22	4	No
16	BELD	Belkheda	917.51	Std-IIR	PI (Metal to Metal)	Siemens	21	3	No
17	KKB	Karakbel	921.8	Std-II	PI (Metal to Metal)	ABB	22	4	No
18	SRID	Shridham	937.207	Std-IIR	PI (Metal to Metal)	ABB	30	4	No

S N	Station Code	Station Name	Central Line (Km No.) Approx.	Standard of Interlocking	Type of Interlocking	Make of Interlocking	No. of Routes	No. of Lines	Junction or Not
19	BMR	Bikrampur	949.02	Std-IIR	PI (Metal to Metal)	ABB	25	4	No
20	BHTN	Bhitoni	960.633	Std-II	PI (Metal to Metal)	ABB	58	4	No
21	BRGT	Bheraghat	973.774	Std-II	PI (Metal to Metal)	ABB	29	4	No
22	KEQ	Kachhpura	984.275	Std-II	PI (Metal to Metal)	ABB	113	5	Yes
23	MLL	Madan Mahal	986.857	Std-II	RRI (Metal to Metal)	Siemens	47	4	No
24	JBP	Jabalpur	990.285	Std-IIR	RRI (Metal to Metal)	Siemens	412	10	No
25	ADTL	Adhartal	998.373	Std-II	PI (Metal to Metal)	Siemens	48	5	No
26	DOE	Deori	1007.134	Std-IIR	PI (Metal to Metal)	Siemens	37	4	No
27	GSPR	Gosalpur	1017.66	Std-II	PI (Metal to Metal)	Siemens	32	4	No
28	SHR	Sihora Road	1028.69	Std-IIR	PI (Metal to Metal)	Siemens	29	4	No
29	DDCE	Dundi	1043.685	Std-II	PI (Metal to Metal)	Siemens	29	4	No
30	SBD	Sleemnabad	1053.157	Std-II	PI (Metal to Metal)	Siemens	22	4	No
31	NWR	Niwar	1067.79	Std-II	PI (Metal to Metal)	Siemens	34	4	No
32	KTE-S	Katni South	1078.98	Standard II for Up & Dn Main line & Standard I for Katni South-New Katni Junction chord line	PI (Metal to Metal)	Siemens	117	6	Yes
33	KTE	Katni-A Cabin	1080/12	Std-IR	PI (Metal to Metal)	Siemens	116	8	Yes
34		Katni-B Cabin	1081/17	Std-IR	PI (Metal to Metal)	Siemens	47		
35	PTWA	Patwara	1089.954	Std-II	PI (Metal to Metal)	Siemens	22	4	No
36	JKE	Jhukehi	1098.14	Std-II	PI (Metal to Metal)	Siemens	111	11	No
37	PKRD	Pakariyaroadd	1107.997	Std-II	PI (Metal to Metal)	Siemens	33	4	No
38	UDR	Amdara	1117.785	Std-II	PI (Metal to Metal)	Siemens	33	4	No
39	BUU	Bhadanpur	1130.44	Std-IIR	RRI (Metal to Metal)	ABB	24	5	No
40	MYR	Maihar	1143.99	Std-IIR	RRI (Metal to Metal)	Siemens	146	10	No
41	UHR	Unchehara	1158.166	Std-II	PI (Metal to Metal)	Siemens	26	4	No

S N	Station Code	Station Name	Central Line (Km No.) Approx.	Standard of Interlocking	Type of Interlocking	Make of Interlocking	No. of Routes	No. of Lines	Junction or Not
42	LGCE	Lagargawan	1167.67	Std-II	PI (Metal to Metal)	Siemens	26	4	No
43	STA	Satna	1179.27	Std-IIR	RRI (Metal to Metal)	Siemens	289	16	Yes
44	SAGM	Sagma	1185.92	Std-II	PI (Metal to Metal)	Siemens	65	5	No
45	JTW	Jaitwar	1199.216	Std-IIR	PI (Metal to Metal)	ABB	34	4	No
46	KTHA	Khutaha	1206.663	Std-IIR	PI (Metal to Metal)	ABB	2	2	No
47	CTHR	Chitahara	1214.285	Std-II	PI (Metal to Metal)	ABB	37	4	No
48	MJG	Majhgawan	1219.82	Std-IIR	PI (Metal to Metal)	ABB	31	6	No
49	TKYR	Tikariya	1233.00	Std-IIR	PI (Metal to Metal)	Siemens	27	4	No
50	MKD	Markundi	1241.032	Std-II	PI (Metal to Metal)	Siemens	25	4	No
51	BQF	Barahmuafi	1248.918	Std-II	PI (Metal to Metal)	ABB	33	4	No
52	BNSP	Bansapahar	1253.271	Std-II	RRI (Metal to Metal)	ABB	63	4	Yes
KMZ-BINA Section									
1	KMZ	Katni Murwara	1235.355	Std-II	RRI (Metal to Metal)	Siemens	122	8	Yes
2	NMWP	New Majhgawa Phatak	1232/4-5	Std-II	EI	SIEMENS	47	5	No
3	HDU	Hardua	1221.376	Std-II	EI	KYOSAN K5BMC	133	7	No
4	PTHD	Patohan	1211.764	Std-II	PI (Metal to Metal)	Siemens	2	3	No
5	REI	Rithi	1205.61	Std-II	EI	KYOSAN K5BMC	66	6	No
6	BQQ	Bakhleta	1197.445	Std-IIR	EI	KYOSAN K5BMC	55	6	No
7	SYA	Salaia	1187.707	Std-II	EI	KYOSAN K5BMC	88	6	No
8	RTGN	Ratangaon	1180.366	Std-IIR	EI	KYOSAN K5BMC	5	3	No
9	SAO	Sagoni	1169.344	Std-II	EI	KYOSAN K5BMC	108	6	No
10	GEA	Ghatera	1153.155	Std-II	EI	KYOSAN K5BMC	37	4	No
11	BNU	Bandakpur	1142.497	Std-II	EI	KYOSAN K5BMC	96	5	No
12	KYX	Karhiya Bhadol	1135.236	Std-II	EI	KYOSAN K5BMC	53	5	No
13	DMO	Damoh	1126.683	Std-II	EI	KYOSAN K5BMC	181	6	No
14	ANA	Aslana	1114.34	Std-II	EI	KYOSAN K5BMC	61	5	No

S N	Station Code	Station Name	Central Line (Km No.) Approx.	Standard of Interlocking	Type of Interlocking	Make of Interlocking	No. of Routes	No. of Lines	Junction or Not
15	PHA	Phatharia	1100.485	Std-IIR	EI	KYOSAN K5BMC	58	4	No
16	GAJ	Ganeshganj	1087.577	Std-II	EI	KYOSAN K5BMC	78	4	No
17	GW	Girwar	1073.874	Std-II	EI	HITACHI	89	7	No
18	LDA	Lidhora Khurd	1063.88	Std-IIR	EI	HITACHI	94	7	No
19	MKRN	Makronia	1056.715	Std-II	EI	HITACHI	115	8	No
20	SGO	Sagour	1049.657	Std-II	EI	HITACHI	91	4	No
21	RTZ	Ratona	1042.5	Std-IIR	PI (Metal to Metal)	Siemens	2	3	No
22	NOI	Narioli	1031.174	Std-II	EI	KYOSAN K5BMC	102	5	No
23	ISH	Isharwara	1023.612	Std-IIR	EI	KYOSAN K5BMC	50	5	No
24	JRK	Jaruakhera	1014.755	Std-II	EI	KYOSAN K5BMC	58	6	No
25	SMRR	Sumreri	1005.587	Std-II	EI	KYOSAN K5BMC	65	5	No
26	KYE	Khurai	996.946	Std-II	EI	KYOSAN K5BMC	124	6	No
27	BJQ	Baghora	985.084	Std-II	PI (Metal to Metal)	ABB	27	4	No
28	MAKR	Malkheri	979.745	Std-II	EI	KYOSAN K5BMC	149	6	Yes
29	MDVK	Mahadeokheri	982	Std-IIR	EI	Medha	115	5	No
NKJ-Mahdeiya Section									
1	NKJ-A	NKJ-A	1034/0	Std-II	EI	KYOSAN K5BMC	268	15	Yes
2	NKJ-B	NKJ-B	1031/2-8	Std-II	EI	KYOSAN K5BMC	159	11	No
3	NKJC	NKJ-C	1029/7	Std-II	EI	KYOSAN K5BMC	567	21	Yes
4	KTKD	Katngikhurd	1092.943	Std-II	EI	SIEMENS	113	6	No
5	SLHA	Salhanha	1110.436	Std-IIR	EI	SIEMENS	41	4	No
6	PWK	Pipariyakalan	1121.007	Std-IIR	EI	SIEMENS	24	4	No
7	KHBJ	Khanna banjari	1131.765	Std-II	EI	SIEMENS	129	6	No
8	MFQ	Mahroi	1143.623	Std-II	EI	SIEMENS	30	4	No
9	VST	Vijaysota	1162.756	Std-II	EI	SIEMENS	34	4	No
10	CTJ	Chhateni	1182.005	Std-II	EI	KYOSAN K5BMC	29	4	No

S N	Station Code	Station Name	Central Line (Km No.) Approx.	Standard of Interlocking	Type of Interlocking	Make of Interlocking	No. of Routes	No. of Lines	Junction or Not
11	BEHR	Beohari	1192.873	Std-II	EI	KYOSAN K5BMC	85	5	No
12	BARD	Dubrikalan	1208.324	Std-II	PI (Metal to Metal)	SIEMENS	22	2	No
13	JOBA	Joba	1232.177	Std-II	EI	KYOSAN K5BMC	35	4	No
14	MWJ	Marwasgram	1239.665	Std-II	EI	SIEMENS	32	4	No
15	NWB	Niwas road	1256.594	Std-II	EI	SIEMENS	74	6	No
16	BSDL	Bharsandi	1265.796	Std-IIR	EI	SIEMENS	29	4	No
17	SSGJ	SursaraiGhat Jhara	1275.9	Std-II	EI	SIEMENS	26	4	No
18	SGAM	Saraigram	1285.245	Std-IIR	EI	SIEMENS	38	4	No
19	GAJB	Gajrabahra	1295.493	Std-IIR	EI	SIEMENS	57	4	No
20	DRGM	Deoragram	1305.944	Std-IIR	EI	SIEMENS	28	4	No
21	MZHL	Majholi	1314.26	Std-IIR	RRI (Metal to Metal)	ABB	85	6	No
22	BRGW	Bargawan	1322.277	Std-II	PI (Metal to Metal)	ABB	65	5	No
23	GNDI	Gondwali	1328.15	Std-II	EI	SIEMENS	113	6	No
KMA-REWA Section									
1	KMA	Kaima	1185.18	Std-IIR	EI	HITACHI	118	7	Yes
2	SKAR	Sakariya	1191.54	Std-IIR	EI	HITACHI	56	4	No
3	HNM	Hinouta Ramban	1199.222	Std-II	EI	HITACHI	65	5	No
4	BGHI	Baghai Road	1208.25	Std-IIR	PI (Metal to Metal)	Siemens	38	3	No
5	TZR	Turki Road	1216.92	Std-IIR	PI (Metal to Metal)	Siemens	28	4	No
6	REWA	Rewa	1228.67	Std-II	EI	HITACHI	196	13	No

4.10 Railway Yards: Same as Para 4.9 above.

4.11. Foot Over Bridges (FOBs) on Railway Project: Refer Engineering Annexure-11H.

4.12. Transmission Lines Crossing the Right of Way: Refer Electrical Annexure-13A.

4.13 Underground Power Line Crossing the Right of Way: Refer Electrical Annexure-13B.

4.14. Signalling Infrastructure: Refer Table- 4.9 above.

4.15. Telecommunication Infrastructure: Refer Signal & Telecommunication Annexure-12B.

4.16 Any other structures:

A. Engineering:

- i. Fixed over Head Structures -Refer Engineering Annexure-11I
- ii. Permanent Speed Restriction -Refer Engineering Annexure-11J
- iii. Gradient List of section -Refer Engineering Annexure-11M
- iv. Forest Area- Refer Engineering Annexure-11L

B. Signal & Telecommunication:

- i. Spare Contact of LC Gate/IBH/Station-Refer S&T Annexure-12C
- ii. Existing Power Supply Details-Refer S&T Annexure-12D
- iii. Existing Microwave Tower Details - Refer S&T Annexure-12E
- iv. IPS Move at Station/LC/IBH- Refer S&T Annexure-12F

C. TRD:

- i. TRD Traction Sub Station at a Glance on WCR- Refer TRD Annexure-13C
- ii. TRD Structure SP/SSP Details- Refer TRD Annexure-13D
- iii. Planning of 2X25KV Traction System- Refer TRD Annexure-13E
- iv. AT Availability in the Section- Refer TRD Annexure-13F

D. Latitude / Longitude RSSI Survey: Refer Annexure 2A

Details of Towers at existing Stations are as follows:

Station Code	Station Name	Distance of existing MW tower from R/R (meters)	Height of MW Tower	"Longitude (Decimal Degree)"	"Latitude (Decimal Degree)"	Whether space available for termination of new 48 Fiber in the existing OFC Room	Type/ Size of Existing Antenna
JBP	Jabalpur	500	100 Mtrs	23' 09" 56.455	79' 57 "24.282	Yes	2 GSM Antenna (RCIL)
NKJ	New Katni Junction	1000	70 Mtrs (Self Supporting Tower)	23' 48"29.5	80'25"58.7	Yes	1xParabolic Antennas 3.3 Dia (Airtel)
NKJ	New Katni Junction	1000	90 Mtrs (Guided Tower)	23' 48"29.5	80'25"58.7	Yes	1 x Yagi antenna (not in use)

Section-II

1.3 OVERVIEW ON THE PROJECT AND MINIMUM FUNCTIONAL AND TECHNICAL REQUIREMENTS:

- 1.3.1 The project envisages implementation of Indian Railway Automatic Train Protection (IR-ATP) by means of KAVACH system as per RDSO specification no. RDSO/SPN/196/2020 Version 4.0 or latest and Technical Advisory Note (TAN) no. SIGOTCAS (TAN)/01/2021 version 2.0, dated 18.10.2021 or latest and testing formats issued on the subject by RDSO from time to time. The scope includes Supply, trenching, duct laying, blowing, splicing, termination, etc. of 4x48 fiber OFC with path diversity (2x48 Fibers on each side of the track) in ITARSI - MANIKPUR, Entire KATNI Complex, BANSAPAHAR-OHAN, SATNA-REWA, KAIMA-SAGMA, KMZ-MAKR, NKJ- 'A' cabin-MHDA section of Jabalpur division of West Central Railway. The scope also includes design, supply, Installation & commissioning of 40 meter 3-legged tubular lattice tower, associated works and construction of S&T service buildings at stations, interlocked LCs/IBHs in Itarsi-Manikpur (ex.), Mahdeiya (ex.)-Bina Malkheri, Entire Katni Complex, Satna-Rewa, Kaima-Sagma, Bansapahar-Ohan sections, for installation of KAVACH system. **The Scope also includes provision of Loco Kavach (On-Board Kavach) system for 32 loco-motives preferably at Electric Loco Shed NKJ/ Diesel Loco Shed NKJ or Location as decided by Authority.** For the purpose of this tender, Entire Katni Complex means “(All stations up to Station Limit and interconnecting lines between Katni-‘A’ cabin, Katni-‘B’ cabin, Katni South, Katni Murwara, New Katni Junction ‘A’ cabin, New Katni junction ‘B’ cabin, New Katni Junction ‘C’ cabin).”
- 1.3.2 The technical requirements (non-exhaustive) for the implementation of the KAVACH system 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/ Authority’s Representative/Authority Engineer must be taken for the technical requirements of other items required for commissioning of KAVACH system in entire sections of JBP division as per latest RDSO specifications. Any deviations from these technical requirements should have prior approval of the Authority/ Authority’s Representative/Authority Engineer.
- 1.3.3 The data and information related to L-section/ Geo technical data provided are indicative and for guidance only. These should be rechecked, verified and modified by conducting site investigation to suit the site conditions. Site Investigation should include but not limited to topographical survey, hydrological survey and geotechnical surveys etc. Any change on account of existing ground conditions mentioned in L- Section/Alignment/ ESPs/SIPs shall not be considered as Change of Scope. For avoidance of doubt, it is clarified that the existing ground conditions are to be validated by bidders before bid and hence no change on this account is payable.
- 1.3.4 The KAVACH system shall be provided in ITARSI-MANIKPUR (ex.), Mahdeiya (ex) - BAGHORA, Entire KATNI Complex, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR-OHAN (ex), having Absolute Block system of working and Automatic Block system of working (Bina Malkheri -Baghora section).
- 1.3.5 Survey, Design, Drawing and Documentation for the entire project. All drawings and plans are to be designed and submitted to Railway. Approved SIPs, Available existing cable route plan, building plan will be provided by Railway.

- 1.3.6 The work is to be executed as per provisions of the Indian Railway Signal Engineering Manual (IRSEM) with latest correction slips, Specifications of the systems & latest guidelines issued by Railway Board & RDSO, approved Signalling Plans and WCR's guidelines (if any).
- 1.3.7 In case of any ambiguity between the drawings and instructions or between any two clauses of the tender document the decision of engineer in charge shall be final.

The scope of the work shall include:

2.0 KAVACH Service building:

- 2.0.1 The scope includes Extension/Modification/Augmentation of Relay Rooms, Equipment Rooms etc. of existing installations in Itarsi-Manikpur(ex.), Katni Murwara-Bina Malkheri, New Katni Jn 'A' Cabin – Mahdeiya (ex), Kaima-Rewa and Bansapahar– Ohan section. Approximate number of service buildings at stations to be constructed is furnished in the table below. (23 nos. Relay room buildings in ET- MKP section including KTES, KTE 'A' and KTE 'B' cabin & 06 Relay room buildings in Mahdeiya-Bina Malkheri and Satna - Rewa section and 01 Auto hut buildings in Baghora to Bina Malkhedi section) for KAVACH work. Also, 33 no. of LC/IBH buildings are also to be constructed for installing LC-Kavach. Any shifting/dismantling work is required for new relay room construction at station is also covered under this project. Ref. Drg for modification in station building is S&T Equipment building/Auto Hut/2022/01 (Annexure-1A). This will involve extension of General Lighting supply from existing distribution board to the newly constructed rooms with suitable protection fuse/MCB.

TABLE: A

(R=Required, NR=Not Required)

Sr. No.	Section	Station	Station code	Space in existing Relay room	Requirement of Building
ET-MKP section					
1	ET-MKP	Itarsi	ET	Yes	NR
2	ET-MKP	Gurra	GRO	Yes	NR
3	ET-MKP	Sontalai	SQL	Yes	NR
4	ET-MKP	Bagaratawa	BGTA	No	R
5	ET-MKP	Guramkhedi	GMD	Yes	NR
6	ET-MKP	Sohagpur	SGP	No	R
7	ET-MKP	Pipariya	PPI	No	R
8	ET-MKP	Bankhedi	BKH	No	R
9	ET-MKP	Salichouka	SCKR	No	R
10	ET-MKP	Gadarwara	GAR	No	R
11	ET-MKP	Baranjh-CEN	BNJH CEN	Yes	NR
12	ET-MKP	Bohani	BNE	No	R
13	ET-MKP	Kareli	KY	Yes	NR
14	ET-MKP	Narsingapur	NU	No	R
15	ET-MKP	Ghatpindri	GPC	Yes	NR
16	ET-MKP	Belkheda	BELD	Yes	NR
17	ET-MKP	Karakbel	KKB	No	R
18	ET-MKP	Shirdham	SRID	No	R
19	ET-MKP	Bikrampur	BMR	Yes	NR
20	ET-MKP	Bhitoni	BHTN	No	R

Sr. No.	Section	Station	Station code	Space in existing Relay room	Requirement of Building
21	ET-MKP	Bheraghat	BRGT	No	R
22	ET-MKP	Kachapura	KEQ	No	R
23	ET-MKP	Madanmahal	MMML	Yes	NR
24	ET-MKP	Jabalpur	JBP	Yes	NR
25	ET-MKP	Adharthal	ADTL	No	R
26	ET-MKP	Deori	DOE	Yes	NR
27	ET-MKP	Gosalpur	GSPR	No	R
28	ET-MKP	Sihora Road	SHR	Yes	NR
29	ET-MKP	Dundi	DDCE	Yes	NR
30	ET-MKP	Saleemnabad Road	SBD	Yes	NR
31	ET-MKP	Niwar	NWR	Yes	NR
32	ET-MKP	Katni- South	KTE-S	No	R
33	ET-MKP	Katni-A cabin	KTE-A	No	R
34	ET-MKP	Katni-B cabin	KTE-B	No	R
35	ET-MKP	Patwara	PTWA	Yes	NR
36	ET-MKP	Jukhehi	JKE	Yes	NR
37	ET-MKP	Pakaria Road	PKRD	Yes	NR
38	ET-MKP	Amdara	UDR	Yes	NR
39	ET-MKP	Bhadanpur	BUU	No	R
40	ET-MKP	Maihar	MYR	No	R
41	ET-MKP	Unchehra	UHR	Yes	NR
42	ET-MKP	Lagargawan	LGCE	Yes	NR
43	ET-MKP	Satna	STA	Yes	NR
44	ET-MKP	Sagma	SAGM	No	R
45	ET-MKP	Jaitwar	JTW	No	R
46	ET-MKP	Khutha	KTHA	Yes	NR
47	ET-MKP	Chitahra	CTHR	No	R
48	ET-MKP	Majhgawan	MJG	No	R
49	ET-MKP	Tikariya	TKYR	No	R
50	ET-MKP	Markundi	MKD	Yes	NR
51	ET-MKP	Baramaufi	BQF	No	R
52	ET-MKP	Bansapahar	BNSP	Yes	NR
KAIMA-REWA SECTION					
1	STA-REWA	Kaima	KMA	Yes	NR
2	STA-REWA	Sakaria	SKAR	Yes	NR
3	STA-REWA	Hinauta Ramban	HNMM	Yes	NR
4	STA-REWA	Baghai road	BGHI	No	NR [#]
5	STA-REWA	Turki road	TZR	No	NR [#]
6	STA-REWA	Rewa	REWA	No	R
[#] : At BGHI and TZR, there is no space in existing RR. work of EI is in progress at these stations and Building for EI has already been constructed. Kavach work is to be executed in the same Relay room in which EI is being installed.					
NKJ-MAHDEIYA SECTION					
1	KTE-SGRL	New Katni-A-CEN	NKJ-A CEN	Yes	NR
2	KTE-SGRL	New Katni-B-CEN	NKJ-B CEN	Yes	NR

Sr. No.	Section	Station	Station code	Space in existing Relay room	Requirement of Building
3	KTE-SGRL	New Katni-C-CEN	NKJ-C-CEN	Yes	NR
4	KTE-SGRL	Katangi Khurd CEN	KTKD-CEN	Yes	NR
6	KTE-SGRL	Salhana cen	SLHA-CEN	Yes	NR
7	KTE-SGRL	Pipariya Kalan	PWK	Yes	NR
8	KTE-SGRL	Khanna Banjari- CEN	KHBJ-CEN	Yes	NR
11	KTE-SGRL	Mahroi	MFQ	Yes	NR
13	KTE-SGRL	Vijaysota	VST	Yes	NR
15	KTE-SGRL	Chateni	CTJ	YES	NR
16	KTE-SGRL	Beohari	BEHR	YES	NR
18	KTE-SGRL	Dubrikala	BARD	No	R
20	KTE-SGRL	Joba	Joba	Yes	NR
21	KTE-SGRL	Marwasgram	MWJ	Yes	NR
23	KTE-SGRL	Niwas Road-CEN	NWB-CEN	Yes	NR
26	KTE-SGRL	Bharsendi	BSDL	Yes	NR
27	KTE-SGRL	Sursaraighat jhara	SSGJ	Yes	NR
28	KTE-SGRL	Saraigram	SGAM	Yes	NR
30	KTE-SGRL	Gajarabakra	GAJB	Yes	NR
31	KTE-SGRL	Deoragram	DRGM	Yes	NR
32	KTE-SGRL	Majholi	MZHL	Yes	NR
33	KTE-SGRL	Bargawan	BRGW	Yes	NR
34	KTE-SGRL	Gondwali	GNDI	Yes	NR
35	KTE-SGRL	Mahdeiya	MHDA	Yes	NR
KMZ-BINA MALKHERI SECTION					
1	KTE-BINA	KATNI MURWARA	KMZ	Yes	NR
2	KTE-BINA	NEW MAJHGAWAN PHATAK	NMWP	No	NR (Spare room to be used for Kavach works)
3	KTE-BINA	HARDUA-CEN	HDU-CEN	Yes	NR
4	KTE-BINA	PATOHAN	PTHD	Yes	NR
5	KTE-BINA	RITHI-CEN	REI-CEN	Yes	NR
6	KTE-BINA	BAKHLETHA-CEN	BQQ-CEN	Yes	NR
7	KTE-BINA	SALAIA-CEN	SYA-CEN	Yes	NR
8	KTE-BINA	RATANGAON	RTGN	Yes	NR
9	KTE-BINA	SAGONI-CEN	SAO-CEN	No	NR (Spare room to be used for Kavach works)
10	KTE-BINA	GHATERA-CEN	GEA-CEN	Yes	NR
11	KTE-BINA	BANDAKPUR-CEN	BNU-CEN	Yes	NR
12	KTE-BINA	KARHIYA BHADOLI-CEN	KYX-CEN	Yes	NR
13	KTE-BINA	DAMOH-CEN	DMO-CEN	Yes	NR
14	KTE-BINA	ASLANA-CEN	ANA-CEN	Yes	NR
15	KTE-BINA	PATHARIA	PHA	Yes	NR
16	KTE-BINA	GANESH GANJ-CEN	GAJ-CEN	Yes	NR
17	KTE-BINA	GIRWAR-CEN	GW-CEN	Yes	NR

Sr. No.	Section	Station	Station code	Space in existing Relay room	Requirement of Building
18	KTE-BINA	LIDHORA KHURD-CEN	LDA-CEN	Yes	NR
19	KTE-BINA	MAKRONIA-CEN	MKRN-CEN	Yes	NR
20	KTE-BINA	SAUGOR-CEN	SGO-CEN	No #	NR
21	KTE-BINA	RATONA	RTZ	No	R
22	KTE-BINA	NARIOLI-CEN	NOI-CEN	Yes	NR
23	KTE-BINA	ISARWARA-CEN	ISH-CEN	Yes	NR
24	KTE-BINA	JERUWA KHERA-CEN	JRK-CEN	Yes	NR
25	KTE-BINA	SUMRERI-CEN	SMRR-CEN	Yes	NR
26	KTE-BINA	KHURAI-CEN	KYE-CEN	Yes	NR
27	KTE-BINA	BAGHORA	BJQ	Yes	NR ##
28	KTE-BINA	AutoHut-2	RH-2	No	R
29	KTE-BINA	BINA MALKHERI-CEN	MAKR-CEN	Yes	NR
# : At SGO station, space in existing relay room is not available hence KAVACH equipment is planned in old relay room. ##: The existing interlocking at BJQ station is PI and EI work is also under progress. Further space in relay room is also available. If EI is commissioned before KAVACH work, the KAVACH equipment will be installed in EI relay room with direct interfacing with KAVACH equipment. No extra cost is payable on this account.					

2.0.2 01 new Relay hut (adjacent to existing Relay Huts for Automatic Signalling) in Bina Malkheri- Baghora Automatic Signalling section to be constructed as per Annexure-1C. Kavach equipment along with Power Supply equipments (IPS as per Annexure-7), 300AH battery set, Class-A protection, Ring Earth, Fire alarm and Fuse alarm are to be installed in new Relay huts. Necessary Signalling gears are to be repeated from Existing Relay huts.

2.0.3 In BGHI and TZR station of Kaima-Rewa section, present Interlocking is PI (Metal to Metal) but work of EI is also in progress at these stations. Building for EI has already been constructed. Kavach work is to be executed in the same Relay room in which EI is being installed. If EI is commissioned before execution of Kavach works, then Kavach related data are to directly interfaced from Kavach ready port in EI otherwise Interfacing from existing PI Relay room to be done for Kavach related data.

2.0.4 OFC equipments at OHAN are to be installed in new equipment building to be constructed as per Annexure-1B.

2.0.5 Quantity of service buildings at stations may vary depend upon the site survey to be conducted by the contractor. The quantity should be approved by Authority/Authority's representative/Authority Engineer. All construction to be done conforming to specifications of works of WC Railway. The buildings should be constructed of 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, fitting of tube lights, fans are to be provided in Relay room extension at stations & S&T service Buildings of interlocked LC gates/IBH as per WCR guidelines. Heavy Duty 5 star rated Split Air conditioners with voltage stabilizers (In stand by arrangement) of appropriate capacity are to be provided in Relay room extension at all stations and one building constructed near Auto huts in Bina-BJQ section as per WCR guideline.

- 2.0.6 The scope also includes Civil engineering works for construction of S&T Service Buildings (as per Annexure-1B (Drg. No. JBP/S&T/P/TCAS/SB)) at Engg. Interlocked LC gates/ IBH which are not being existing in RF communication zone. This also includes extension of General Lighting supply from existing distribution board to the newly constructed rooms with suitable protection fuse/MCB, extension of Roads up to Service Building from existing roads within Railway boundary and its approach from roadside and trackside. These requirements are indicative & there may be minor changes with regard to dimension of the new rooms, number of new rooms required based on detailed site survey and equipments required to be installed. Approval of Authority/Authority Representative to be obtained with detailed justification w.r.t. alteration in dimension of rooms and/or number of rooms required as given above. No additional payment can be done on this account.
- 2.0.7 Electrification of the Service Buildings at interlocked LC gates/ IBH not being existing in RF communication zone and at new relay room buildings being constructed at Stations wherever required shall be done with ISI/BIS marked and WCR approved fittings.
- 2.0.8 The survey of the location of the relay room 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.
- 2.0.9 Methodology of the work of extension of relay rooms shall generally follow the sequence. Clearing the site of construction by shifting of existing utility or dismantling as provisionally indicated in each station drawing and as per survey by bidder has to be ensured. This will not be treated as change of scope.
- 2.0.10 Construction of new room/s, (Size and location indicated in drawing) at Stations.
- 2.0.11 Shifting of Signalling assets in newly constructed rooms, if required.
- 2.0.12 Constructing adequate support for facilitating opening in existing relay room wall of adequate size.
- 2.0.12 Finally, extension of existing relay room to vacated/newly constructed room by providing adequate size opening.

2.1 Signalling and Telecommunication works:

Provision of KAVACH System

Minimum Scope of the work for KAVACH System include:

- 2.1.1 The KAVACH System shall be provided to cover all lines in ITARSI – MANIKPUR (ex.), Mahdeiya (ex.) - BINA MALKHERI Entire KATNI Complex, SATNA- REWA, KAIMA-SAGMA, BANSAPAHAR – OHAN (ex.) of Jabalpur division of West Central Railway with existing Signalling system i.e. Absolute Block System and Automatic block system.
- 2.1.2 Design, Supply, Installation, Testing and commissioning of On Board KAVACH equipments in 32 Locomotives and trackside/stationary KAVACH equipment at station/LC/IB location/ Block Section along with associated Signalling and telecom works.
- 2.1.3 The KAVACH system shall be provided as per RDSO specification no. RDSO/SPN/196/2020 Version 4.0 or latest and Technical Advisory Note (TAN) no. SIGOTCAS (TAN)/01/2021 version 2.0, dated 18.10.2021 or latest and shall be procured from RDSO approved sources. KAVACH equipments installed at the station and Interlocked LCs/IBHs are to be wired & equipped to their capacity as per requirement of the system and as specified vide RDSO specifications and TAN. All accessories for complete commissioning of KAVACH system to be provided by the contractor. However, supply of SIM cards required under this project is to be done by Railways.
- 2.1.4 Supply, installation, testing & commissioning of KAVACH and its sub-system shall be as per RDSO Functional Requirements Specification (FRS), System Requirements Specification (SRS) and Annexures A1, A2, A3, B, C, D, E1, F, G, H, I, J, P and Q issued by RDSO time to time and their amendments (if any) and as available on RDSO website.
- 2.1.5 KAVACH equipment shall consist of (a) Station KAVACH (b) Loco KAVACH (c) RIU (Remote Interface Unit) with at least 32 Field I/P's (c) LC KAVACH & their associated equipment such as Radio Modems, Radio Antenna, GPS Antenna, GSM Antenna, OFC interfaces, NMS interfaces, DMI, Break Interface Unit suitable for different Locomotives, RFID Tags, RFID readers, Signalling Cables, Power cables, OFC and OFC equipments and any other equipments & materials required for execution/commissioning of this work.
- 2.1.6 Onboard Loco KAVACH Equipment to be installed preferably at New Katni Junction Electric Loco shed and New Katni Junction Diesel Loco shed of Jabalpur Division or at any other location in West Central Railway jurisdiction as decided by the Authority and Stationary KAVACH with associated RF tower for communication between Station/LC/IBH KAVACH & On Board KAVACH shall be provided at stations/LC/IBH of ITARSI – MANIKPUR (ex.), Mahdeiya (Ex.)- BINA MALKHEDI, Entire KATNI Complex, SATNA-REWA, KAIMA- SAGMA, BANSAPAHAR –OHAN (ex.) Section.
- 2.1.6a The On-Board Equipment shall be fitted on selected Locomotives along with UHF radio system for communication between On Board KAVACH equipment in Loco & Station KAVACH equipment all along the route. Two Loco KAVACH Test benches are also to be provided at location in West Central Railway jurisdiction as decided by the Authority.
- 2.1.7 The scope includes Supply, Installation, Programming, Verification and

Commissioning of RFID tags including 20 % Spares at Stations and block sections consisting of interlocked and non-interlocked LCs, IBS & Auto signals.

- 2.1.8 Guidelines for installation of RFID Tags in the block section to get the benefit of non-Signalling-based collision prevention feature of KAVACH with KAVACH equipped Locomotives/Cabs in Non-KAVACH territory shall be followed as issued by RDSO and COE dated 28.06.2024.
- 2.1.9 Painting scheme for sleepers fitted with RFID Tags-
- (a) Portion of the sleeper inside the rails to be painted in 'WHITE' and outside rail in 'YELLOW' on either side of the rail.
 - (b) The concerned RFID Tag no. to be written in BLACK paint with bold capital letters on WHITE paint background (Font of these letters should be such that it should be visible on the sleeper surface).
 - (c) Quality of paint should be weather proof with long lasting feature.
- 2.1.10 UHF communication shall be used for communication between Stationary KAVACH and On-board Equipment. Entire stretch including stations and block sections where KAVACH is to be provided shall be covered with UHF communication to have complete coverage of the entire ITARSI – MANIKPUR (ex.), MAHDEIYA (Ex.)- BINA MALKHERI, Entire KATNI Complex, SATNA - REWA, KAIMA- SAGMA, BANSAPAHAR –OHAN (ex.) Section of Jabalpur division of West Central Railway with overlapping radio coverage between adjacent towers as per the preliminary RSSI survey conducted by the Authority (Annexure:2A) and separate RF survey to be done by contractor for this purpose duly approved by authority/authority representative.
- 2.1.11 LTE network has been planned to be provided by the Authority in this section at a later stage for which RF survey to decide location of towers is being conducted and the report indicating locations of LTE towers will be provided in later stage at the specific request of the bidder.
- 2.1.12 RF Survey of the UHF for Kavach in all lines of ITARSI - MANIKPUR, Mahdeiya - BINA MALKHERI, Entire KATNI Complex, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR - OHAN of Jabalpur division to be conducted for giving continuous UHF coverage. RF survey to be done by contractor in such a way to locate UHF-Kavach towers at the tower location as per LTE survey.
- 2.1.13 The scope of work also involves design, supply, fabrication, installation & commissioning of 40-meter-high tubular lattice 3-legged tower as per RDSO drg no. RDSO/TC/TOWER/L/40/180/T/6.5 dated 23.12.2021, suitable for 180 kmph wind speed (up to 6.5 EPA) at stations/IBs/LCs/section including antenna, aviation lamp with provision of fencing around KAVACH tower with requisite cables, modems, antenna, including schematic painting and earthing work etc. The contractor can himself execute the work of towers, only in case he has experience as mentioned in Clause 2.2.2.1/ii of RFP for EPC to value of estimated Tower work as mentioned in schedule 'G' of draft EPC Agreement after taking approval from Authority otherwise contractor shall execute Tower work involved in project by engaging sub-contractor as per clause 3.2 of draft EPC

agreement having experience of Supply, Fabrication, erection and commissioning of Telecom/electric/spun concrete/spun electric towers or execution of bridge work consisting of construction and launching of steel girders.”

- 2.1.14 Approved Designs for Towers & Foundations are available on RDSO website for soil bearing capacity of 100 KPA. If these designs are not fit for the purpose, then designing, design adequacy certificate and design report of Tower and/or foundations will be mandated & verified by third party (CPRI or any IITs) and will be approved by Authority/representative of authority. The newly erected tower must be suitable for mounting LTE antenna in addition to UHF antenna.
- 2.1.15 At sites where Black Cotton Soil is encountered, Cohesive Non-Swelling Soil (CNS) layer (minimum 250 mm or more as advised by Geotechnical Consultant) shall be provided at the foundation bed. In addition, at such sites, backfill soil to be mixed with bought out soil or stone dust to increase its density based on the recommendations of Geotechnical Consultant.
- 2.1.16 Safety and Execution Guidelines for Works Near Railway Tracks and Tower Foundations:
- (a) Barricading Near Railway Tracks: Prior to the commencement of any work near railway tracks, the contractor shall install barricades at a minimum distance of 3.5 meters from the nearest railway track. These barricades must remain in place at all times during the execution of the work. The contractor shall adhere to all safety precautions in accordance with the prevailing practices of West Central Railway.
 - (b) Safety Measures for Excavation: For excavation work related to tower foundations or HDD pits, the contractor shall take full responsibility for ensuring the safety of workmen and passersby. The contractor shall provide clearly visible markings, including retro-reflective or fluorescent markings for night visibility, caution boards, and barricading at their own cost.
 - (c) Ownership of Released Barricading Materials: Upon completion of the work, the materials used for barricading shall remain the property of the contractor.
 - (d) Closure of HDD Pits: All HDD pits must be closed promptly upon the completion of ducting work to ensure site safety and cleanliness.
 - (e) Plastering of Tower Leg Areas: The area enclosed by the legs of towers shall be finished with 100 mm of cement concrete plastering to ensure cleanliness and prevention of undesirable vegetation including plants, grasses etc.
 - (f) Provision of Locks for Tower Fencing: The contractor shall provide high quality locks, such as those of Link, Harrison, or Godrej make, for securing the doors installed in the fencing of towers.
 - (g) All precautions as mentioned vide PCE/WCR's circular no. 17/2015-16 vide letter no. W-HQ/W-4/Track/PCE/CIR/4 dated 30.03.2016 and correction slip no. 1 to above circular vide letter no. W-HQ/W-4/Track/PCE/Cir.74/4 dated 27.02.2018 and Minutes of Meeting vide letter no. 04/01-2025/Rly.Bd dt. 13.01.2025 shall be followed strictly by contractor for the work site protection. Copy of circular and Minutes of Meeting attached.
- 2.1.17 Towers, antennas, Radio equipments to be provided at such locations to ensure continuous coverage with minimum overlap of 1000 meters (for smooth handover process) in the all lines of ET-KTE, KTE-MKP (ex.), NKJ 'A' – MHDA (ex.), KMZ-MAKR, STA-REWA, KMA-SAGM, BNSP-OHAN (ex.) and entire Katni Complex of Jabalpur division.

2.1.18 In Absolute Block Signalling territory, mid-section interlocked LCs/IBHs which are not in RF communication coverage of station tower, independent tower of preferably 40 meters with LC KAVACH equipment at LCs/IBHs shall be installed. If 40 meters tower cannot be installed at any location due to unavoidable circumstances, approval of Authority/Authority's representative/Authority Engineer must be taken beforehand duly giving justifications. All Towers to be provided in Railway Land only. Land Plans have been attached (Annexure- 11K).

2.1.19 LC KAVACH equipments with associated RF towers including requirement of buildings or RIU shall be installed at following Interlocked Engg. LC/IBS under scope of work for KAVACH:

TABLE:B

(R=Required, NR= Not Required)

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVACH/ Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
ET-MKP Section including BNSP-OHAN section							
1	IBH-226	ET-GRO	750.17	R	NR	Yes	No
2	IBH-229	BGTA-GMD	778.7	R	NR	Yes	No
3	230	BGTA-GMD	782.778	NR	R	-	-
4	231	GMD-SGP	790/15	R	NR	No	Yes
5	IBH-234	SGP-PPI	804.157	R	NR	Yes	No
6	234	SGP-PPI	805.35	NR	R*	-	-
7	237	PPI-BKH	817.78	R	NR	No	Yes
8	IBH-239	PPI-BKH	822.92	R	NR	Yes	No
9	239	PPI-BKH	823.103	NR	R*	-	-
10	241	PPI-BKH	827.989	NR	R	-	-
11	IBH-246	BKH-SCKR	838	R	NR	No	Yes
12	246	BKH-SCKR	838.85	NR	R*	-	-
13	250	BKH-SCKR	846.62	NR	R	-	-
14	IBH-256	SCKR-GAR	856.15	R	NR	Yes	No
15	257	SCKR-GAR	858.45	NR	R	-	-
16	260	GAR-BNJH	865.84	R	NR	No	Yes
17	IBH-	BNE-KY	882.12	R	NR	Yes	No

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVACH/ Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
	268						
18	IBH-275	KY-NU	900.255	R	NR	No	Yes
19	275	KY-NU	901.78	NR	R*	-	-
20	284	BELD-KKB	920.8	NR	R	-	-
21	IBH-290	KKB-SRID	930.73	R	NR	Yes	No
22	292	KKB-SRID	934.7	NR	R	-	-
23	295	SRID-BMR	942.3	NR	R*	-	-
24	IBH-295	SRID-BMR	943.2	R	NR	Yes	No
25	299	BMR-BHTN	954.1	NR	R*	-	-
26	IBH-299	BMR-BHTN	954.996	R	NR	Yes	No
27	301	BMR-BHTN	959.45	NR	R	-	-
28	305	BHTN-BRGT	965.5	NR	R	-	-
29	BHTN-BRGT IBH	BHTN-BRGT	967.147	R	NR	No	Yes
30	307	BHTN-BRGT	968.33	NR	R*	-	-
31	310	BGRT-KEQ	974.91	NR	R	-	-
32	BGRT KEQ IBH	BGRT-KEQ	979.32	R	NR	Yes	No
33	IBH-318	JBP-ADTL	994.42	R	NR	Yes	No
34	323	ADTL-DEO	1004.459	NR	R	-	-
35	324	ADTL-DEO	1005.73	NR	R	-	-
36	326	DOE-GSPR	1009.113	NR	R	-	-
37	327	DOE-GSPR	1010.89	NR	R*	-	-
38	IBH-327	DOE-GSPR	1011.6	R	NR	Yes	No
39	328	DOE-	1013.973	NR	R	-	-

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVAC H/ Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
		GSPR					
40	331	GSPR-SHR	1019.2	NR	R	-	-
41	332	GSPR-SHR	1020.67	NR	R	-	-
42	IBH-334	GSPR-SHR	1023.55	R	NR	Yes	No
43	338	SHR-DDCE	1035.15	NR	R*	-	-
44	IBH-338	SHR-DDCE	1035.96	R	NR	No	Yes
45	339	SHR-DDCE	1037.675	NR	R	Yes	No
46	340	SHR-DDCE	1041.45	NR	R	-	-
47	342	DDCE-SBD	1047.5	R	NR	No	Yes
48	343	DDCE-SBD	1050.8	NR	R	-	-
49	345	SBD-NWR	1054.64	NR	R	-	-
50	346	SBD-NWR	1057.867	NR	R	-	-
51	IBH-347	SBD-NWR	1058.767	R	NR	Yes	No
52	347	SBD-NWR	1060.037	NR	R*	-	-
53	NWR-KTES IBH	NWR-KTE(S)	1073.45	R	NR	Yes	No
54	353	NWR-KTE(S)	1075.42	NR	R	-	-
55	IBH-357	KTE-PTWA	1085.5	R	NR	Yes	No
56	358	PTWA-JKE	1091.55	NR	R	-	-
57	IBH-372	UDR-BUU	1124.133	R	NR	Yes	No
58	375	BUU-MYR	1133	NR	R	-	-
59	376	BUU-MYR	1134.15	NR	R*	-	-
60	IBH-376	BUU-MYR	1135.82	R	NR	No	Yes
61	378	BUU-	1141.885	NR	R	-	-

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVAC H/ Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
		MYR					
62	IBH-380	MYR-UHR	1149.49	R	NR	Yes	No
63	LGCE-STABH	LGCE-STABH	1173	R	NR	Yes	No
64	IBH-392	SAGM-JTW	1193.33	R	NR	No	Yes
65	MJG-TKYRIBH	MJG-TKYR	1225.774	R	NR	Yes	No
66	400	TKYR-MKD	1235.84	NR	R	-	-
67	403A	BNSP-MKP	1254.23	NR	R	-	-
KMZ-MAKR section including MAKR-MDVK & MAKR-AGD Section							
1	LC-310A	MAKR-MDVK	980.995	NR	R	-	-
2	LC - 4	KYE-BJQ	989 / 7-8 (989.712)	NR	R*	-	-
3	IBH-KYE-BJQ	KYE-BJQ	990.546	R	NR	No	Yes
4	LC -8	SMRR-KYE	998 / 0-1	NR	R	-	-
5	LC - 11	JRK-SMRR	1011/8	NR	R*	-	-
6	IBH-JRK-SMRR	JRK-SMRR	1011.436	R	NR	No	Yes
7	LC - 16	NOI-ISH	1028 / 9-10	NR	R	-	-
8	IBH-RTZ-NOI	RTZ-NOI	1036/1-2	R	NR	No	Yes
9	LC - 21	SGO-RTZ	1045 / 4-5 (1045.478)	NR	R	-	-
-10	LC - 23	SGO-RTZ	1048.449	NR	R	-	-
11	LC - 26	MKRN-SGO	1050 / 7-8 (1050.729)	NR	R	-	-
12	LC - 27	MKRN-SGO	1051 / 1-2 (1051.125)	NR	R	-	-
13	IBH-MKRN-SGO	MKRN-SGO	1052.47	R	NR	No	Yes

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVAC H/ Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
14	LC - 29	MKRN-SGO	1054.05	NR	R	-	-
15	LC - 32	LDA-MKRN	1059 / 2-3	NR	R	-	-
16	IBH-GW-LDA	GW-LDA	1068.65	R	NR	No	Yes
17	IBH-GAJ-GW	GAJ-GW	1079.96	R	NR	No	Yes
18	IBH-PHA-GAJ	PHA-GAJ	1092.225	R	NR	No	Yes
19	IBH-ANA-PHA	ANA-PHA	1107/6-7	R	NR	No	Yes
20	IBH-DMO-ANA	DMO-ANA	1118/30	R	NR	No	Yes
21	LC - 60	KYX-DMO	1128 / 3-4	NR	R	-	-
22	LC - 67	BNU-KYX	1136 / 29-31	NR	R	-	-
23	IBH-GEA-BNU	GEA-BNU	1148/7-8	R	NR	No	Yes
24	IBH-SAO-GEA IBS	SAO-GEA IBS	1160.904	R	NR	No	Yes
25	IBH-RTGN-SAO	RTGN-SAO	1174.962	R	NR	No	Yes
26	IBH-BQQ-SYA	BQQ-SYA	1192.755	R	NR	No	Yes
27	LC - 100	PTDH-REI	1206 / 1-2 (1206.183)	NR	R	-	-
28	LC - 102	PTDH-REI	1210 / 1-2	NR	R	-	-
29	IBH-HDU-PTHD	HDU-PTHD	1215.374	R	NR	No	Yes
NKJ 'A' - Mahdeiya Section including entire Katni Complex							
1	IBH-	KTKD-	1100.77	R	NR	No	Yes

Sl. No.	Engg. Interlocked LC /IBS	Section	Chainage KM (Approx.)	Requirement of LC KAVACH / Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
	LEK (KTKD-SLHA)	SLHA					
2	MFQ-VST IBH Damoy	MFQ-VST	1152.38	R	NR	No	Yes
3	IBH VST-CTJ	VST-CTJ	1172.06	R	NR	No	Yes
4	IBH BEHR-BARD	BEHR-BARD	1201.38	R	NR	No	Yes
5	JOBA-BARD IBH	JOBA-BARD	1219.64	R	NR	No	Yes
6	MWJ-NWB IBH	MWJ-NWB	1248.88	R	NR	No	Yes
7	LC-88	SGAM-GAJB	1287.632	NR	R	No	No
KMA-REWA Section including KMA-SAGMA Section							
Sl. No.	Engg. Interlocked LC/IBS	Section	Chainage KM	Requirement of LC KAVACH / Tower/ UHF Antenna	Requirement of RIU at IBH/ LC	Space in existing RR	New Building required
1	LC 8	HNM-BGHI	1200/2-3	NR	R	-	-
2	LC 11	HNM-BGHI	1203.708	R	NR	No	Yes
3	LC-17	TZR-REWA	1219/0-1	NR	R	-	-
4	LC 18	TZR-REWA	1220.880 (1220/8-9)	R	NR	No	Yes

*: Interlocked LCs where IBH is provided, RIU may be provided for repeating of aspects to LC-KAVACH at IBH as required or Signalling cable may be used for the same.

2.1.19a All Interlocked LC gates & IBS which are under radio coverage of adjacent stationary KAVACH, shall be connected through RIU to adjacent stationary KAVACH through dark fiber with path diversity and in ring protection manner using

4x48 Fiber OFC laid (2x48 fiber OFC one in trench on either side of the track)
Connectivity of Stations, IBS, LC Gates shall be through OFC in redundant mode in such a way that any single/double fiber cut shall not lead to disruption of Kavach system.

- 2.1.20 OFC shall be the only media for connecting the various RIUs to the Stationary KAVACH unit. The maximum number of dark fibers shall be four Single mode OFC per ring. Primary and Secondary rings shall be used for ring protection.
- 2.1.21 In Automatic Block Signalling territory, the signal information of overlap communication zone (of at least two/three signals) shall have to be wired to either side of stations through redundant RIUs for relaying the Movement Authority (MA) information for smooth handing over of Loco KAVACH from one Station KAVACH to another during communication change over between stations to avoid abrupt braking by Loco KAVACH in Auto section.
- 2.1.22 In Automatic Block Signalling territory, LC-KAVACH/RIUs shall be placed in the new relay huts constructed and Repeater relays of existing ECRs of signal aspects and axle counter VPR/Track circuits TPRs available in ABS huts shall be picked up to interface with LC-Kavach/RIUs if spare contacts in the relays are available. If spare contacts in existing relays (ECRs/VPRs/TPRs) are not available, new relays must be wired for this purpose. New IPS should be provided in the new relay huts constructed for automatic block Signalling territory in BJQ- MAKR section only. AT supply can be extended from existing AT supply already available in Auto Hut (RH-2).
- 2.1.23 WPC and SACFA clearance: The frequency spectrum for the operation for KAVACH is already finalized by Railway Board. In order to avoid complications at later stages, the application for WPC & SACFA shall be filed so that the license remains with Railways. The Contractor shall prepare all the required documents for obtaining WPC clearance and SACFA clearance for use of towers and radios. Payment of various charges and fees towards WPC License, Royalty, Additional Royalty, SACFA, etc. shall be made by Railways only for Non-Dealer Possession License or End User License. The application for WPC license and SACFA clearance will be filed at Wireless Planning Commission, Ministry of Telecommunication, New Delhi.
- 2.1.24 Processing of various clearances like wildlife, forest and any other permission / permit / license from different agencies is to be initiated, processed and liasoned by contractor on behalf of Railways. Wildlife & Forest clearance may be needed in the KTE-SGRL and STA-MKP section or any other section as envisaged in the scope of work. Bidder has to conduct survey before bid for this aspect.
- 2.1.25 The contractor shall be responsible for obtaining any and all necessary permissions, permits, or licenses from relevant agencies, as required for the execution of the work.
- 2.1.26 SIM (Preferably Machine to Machine) shall be provided by the Authority for the KAVACH equipment.
- 2.1.27 Utility shifting works for executing this work, along with their restoration, wherever required, are part of this work. Shifting of cable (Signalling/telecom/electrical etc.), location boxes, water

pipeline, breakage/restoration of boundary wall etc. is considered as part of this work.

- 2.1.28 Submission of Safety Case documents. (Document related to ISA certification per KM)
- 2.1.29 An Independent Safety Assessor (ISA), engaged from the approved panel of RDSO, shall evaluate all aspects of the Kavach system's safety. This includes assessing the behavior of station Kavach systems with various RDSO-approved onboard systems from different manufacturers, the performance and safety of train operations during system or subsystem shutdown/restarts, leading to critical situation, the resilience of the system against potential cyber-attacks, and the identification and mitigation of other potential hazards. The assessments and certifications by the ISA shall ensure the comprehensive Reliability, Availability as per Technical Advisor Note no. RDSO- SIGOTCAS (TAN)/01/2021 version 2.0, dated 18.10.2021 or latest.
- 2.1.30 Testing & commissioning of KAVACH system for the entire section.
- 2.1.31 Training to Railway staff (1 Lumpsum training package of 200 man-days) as detailed in EPC document para 3.9.1 (Article-3)
- 2.1.32 Supply and Installation of (minimum 2 cameras per Building) STQC certified 5 MP IR BULLET CAMERA with motion- sensing capabilities and an IP67 rating (minimum) for water resistance. Supply of CAT-6 cable, OFC for connecting the camera to 2 no. of 64 Channel NVR at JBP control room. Continuous monitoring of all the cameras to be provided at JBP control room. Suitable hard drives also to be provided for storage of all camera recordings for minimum of 30 days. Two no. of cameras to be provided at each building in mid-section and each building for LC-Kavach equipment.

2.2 Interlocking Details:

- 2.2.1 In ET-MKP section, 07 stations (ET, MML, JBP, BUU, MYR, STA, BNSP) have RRI and 01 station (BNJH) have EI. Rest all stations in ET-MKP section have Metal to Metal PI. In KMZ-Bina Malkheri-Mahadeokheri section, 01 station (KMZ) has RRI, 03 stations (PTHD, RTZ, BJQ) have Panel interlocking and, 25 station have EI. In KMA-Rewa section, 02 stations (BGHI, TZR) have Panel interlocking and 04 station have EI. In NKJ-SGRL section, 01 station (MZHL) has RRI, 02 stations (BARD, BRGW) have Panel interlocking and 20 station have EI. Details of Signalling infrastructure is given in Annex-I, Sch-A para 4.10- Railway Stations on Railway project.
- 2.2.2 Wherever Electronic Interlocking is available at Stations/IBS etc. and KAVACH enable port is not available, suitable modifications in EI have to be carried out to provide Kavach Ready EI port for direct interfacing at data level with KAVACH in compliance to Railway Board's letter no. 2018/Sig/18/EI/Gen. dated 04.09.2024 and RDSO letter no. RDSO-SIG0MISC(GEN)/1/2021Part (1) dated 17.08.2024 & WCR S&T HQ letter No. No.WCR/N-HQ/160/Drg-Corrs/Misc. Dt 07/4/2025. Relay interfacing at EI stations will not be permitted without approval of Authority. Station/LC/IBS KAVACH shall be connected to adjacent KAVACH through OFC for exchange of data for achieving cab Signalling.
- 2.2.3 It is envisaged that wherever two contacts are spare in existing relays, the same are to be utilized for input to KAVACH and repeater relays to be opened only when two spare contacts are not available. If spare contacts are not available, then preferably repeater relays (similar

to the relays used in existing installation) to be installed in spare spaces in existing relay racks, their back contacts proved in existing interlocking circuits and then front contacts should be utilized for KAVACH system. Repeater relays should be similar to the relays used in existing installation. If there is no spare space in existing relay racks, new relay rack may be installed preferably in existing relay room, spare relays installed and wired including back contact proving. It is further clarified that as far as possible additional relay rack for repeater relays (where spare contacts are not available) shall be provided in the existing relay room.

- 2.2.4 At Itarsi station, provision of station KAVACH, RFID Tags, relay interfacing and indoor wiring of all signals controlled by ET for ET-GRO section is not covered under the scope of this work. However provision of tower, UHF antennas, Radio equipments, power supply for radio equipments from relay room to tower radio equipments in redundant manner, Ring earth for tower structure & radio equipments, FDMS, 42 U rack including laying and termination of 2x24 fiber OFC in redundant path with route diversity from relay room to tower radio equipments and laying & termination of 4x48 Fiber OFC with path diversity and ring protection manner at ET station for ET-GRO block section is covered under this work. UHF antennas, Radio equipments and power supply equipments shall be compatible/interoperable with Station Kavach equipment provided by different OEM (Probably HBL).
- 2.2.5 All signals that are controlled from Gondawali (GNDI) station and existing between Gondawali-Mahdeiya section shall be catered with the Station KAVACH system of Gondawali station. This shall also include indoor wiring and direct interfacing of existing interlocking system with Station KAVACH of GNDI station. Further all signals that are controlled from Bansapahar (BNSP) station and existing between BNSP-OHAN, BNSP-MKP and BNSP-BQF section shall be catered with the Station KAVACH system of BNSP station. This shall also include indoor wiring and direct interfacing of existing interlocking system with Station KAVACH of BNSP station.”
- 2.2.6 As MAKR is commissioned with EI, Provision of Station Kavach and relay interfacing for all Signals controlled by MAKR i.e., for MAKR-BJQ, MAKR-MDVK, MAKR-AGD & MAKR-BINA lines is considered under the scope of this tender. The scope also includes provision of tower, UHF antennas, Radio equipments, power supply for radio equipments from relay room to tower radio equipments in redundant manner, Ring earth for tower structure & radio equipments, FDMS, 42 U rack including laying and termination of 2x24 fiber OFC in redundant path with route diversity from relay room to tower radio equipments & laying & termination of 4x48 Fiber OFC with path diversity and ring protection manner at MAKR station for communication between MAKR-BJQ section.
- 2.2.7 RFID tags shall also be provided up to the jurisdiction of Jabalpur division of WCR in Malkhedi-Agasod, Gondawali-Mahdeiya, Bansapahar-Manikpur and Bansapahar-Ohan section.

2.3 Interfacing of the KAVACH system with Existing Interlocking system at stations,

Auto Huts and interlocked LC gates/IBHs:

- 2.3.1 Supply & fixing of powder coated Relay Rack Assembly /Composite Relay Rack Assembly complete with scaffolding, fixtures and accessories including MS Bars / relay frames for fixing of relay plug boards, string rods, fuse strips with bracket, 11 Way Bus Bars with cover and mounting brackets, runway for cable/wires, frame, base assembly etc. Siemens' type or equivalent Q-series relay rack Drg & as per extant practice on W.C. Rly. Rack arrangement as per Sketch no Sk-727 as attached in list of drawings and Rack plan as approved by Engineer in charge. Rack should be made of first-class steel powder coated painting and rack manufacturer's certificate should be submitted. All runway for cables / wires shall be provided with PVC sleeve of proper size.
- 2.3.2 Supply, fixing, wiring & soldering of Tag Blocks 200 way & 96 way with cover as per IRS: S- 77/2006 (Rev. 1) with latest amendment and Drg No.SA-24751 as per requirement for Relay interlocking.
- 2.3.3 Installation of Relay Rack Assembly/Composite Relay Rack Assembly including IDF pillars complete with wall supports, scaffolding, ladders, runway for cables, Relay/Relay group base plates, fixing of Tag blocks etc. The work shall be done as per approved plan, extant practice on W.C. Railway & the instructions of Rly. engineer at site.
- 2.3.4 Supply, fixing & wiring of Relay DC Neutral Line Relay, Non ACI, 24V/60 V DC (Metal to Metal Contact), plug-in-type, as per requirements, conforming to IRS:S-46 with Amdt.1, IRS S 23-88 ; IRS S 34-68 and firm's specification. The relay housing shall contain two miniature identical relays in mini group housing complete with base plate to achieve relay interlocking for automating signalling.
- 2.3.5 Supply, fixing & wiring of Relay AC Immune, plug in Type, M to C, Twin, DC Neutral, Line relay ACI, Style QNNA1, 24 V DC, 6F-2B & 6F-2B /4F-4B & 4F-4B Contact, Code CDEHX/ACDHJ as per requirements, conforming to BRS:960 ; IRS S 34 ; IRS S 23 ;IRS S 60-78 and firm's specification.
- 2.3.6 Circuit Wiring / Jumpering as per wiring diagrams in the relay rack / IDF rack / tag block. This includes preparation of jumper sheets duly checked by firm's site supervisor and wire to wire testing as per wiring diagram. Jumper wire and other material like solder wire etc. will be supplied by contractor.

2.4 Indoor Signalling Works:

- 2.4.1 Alteration in indoor wiring (Wherever Required) by running of Indoor cables and carrying out jumpering as per approved circuit diagram at station including Fixing of relays & relay groups and other associated works as per standard practices of West central Railway wherever required for commissioning of Kavach.
- 2.4.2 16/0.2 mm size tinned flexible single core indoor wire IRS:S-76/89 Amend.No.2 or with latest amendment/ specification, PVC coated in different colours and PVC insulated Rly Signalling Indoor 40 core 0.6 mm cables, 60 core 0.6 mm cables & 24 core 1 mm cables as per IRS (S) 76 / 89 amendment II or with latest amendment / specification to be used.

- 2.4.3 Screw less type Disconnect Terminal block for Four conductors are to be used. (Wherever Required)
- 2.4.4 For screw less type terminals, disconnect Terminal block for Four conductors with screw less Cage Clamp type/ sliding switch RDSO Specification No. RDSO/SPN/189/2004 version 3.0 or latest, for each conductor size up to 2.5 Sq. mm Equivalent of M6 Terminals shall be used. Each Terminal block shall be equipped with two markers on top and bottom, an end plate, 2 end clamps & adequate length rails for fitting terminal blocks.
- 2.4.5 Power wires with following details shall be supplied by contractor and used as per standard practices of WCR. Power wire (copper, multistrand) as per IS 2465/1984 & IS 694/1990 (1x6Sq.mm), 85 conductors each dia 0.30 +/- 0.01 with insulation thickness of 1.2 mm, nominal conductor resistance 3.30 ohms/km and test parameters as per IRS (S) 76/89; Power wire (copper, multistrand) as per IS 2465/1984 & IS 694/1990 (1x16 Sq.mm), 101 Conductors each dia 0.45 +/- 0.01 with insulation thickness of 1.20 mm nominal conductor resistance 1.21 Ohms/Km and test parameters as per IRS(S) 76/89 rev. 2.0 or latest; Power wire (copper, multi strand) as per IS 2465/1984 & IS 694/1990 (1x10Sq.mm), 140 conductor each dia 0.30 +/- 0.005 with insulation thickness of 1.2 mm nominal conductor resistance 1.815 ohms/ km and test parameters as per IRS (S) 76/89.
- 2.4.6 FUSE BLOCK MADE OF PBT/POLYCARBONATE as per IRS S 75/2006 & RDSO Drg No SA-23748 Alt 4 suitable for Cartridge fuse block cylindrical head fuse links, non-deteriorating type low voltage cylindrical head cartridge ELECTRIC fuse 2A as per Spec No IRS/S/78/92 with latest amendments.
- 2.4.7 PPTC fuses are to be procured from firms conforming to UL Thermistor Standard 1434 and having UL recognition with valid UL file number, viz. Little fuse/ Fuzetec/ Tyco/ Bourn/ Raychem or equivalent etc. Ratings of PPTC fuses shall be as follows: PPTC Fuse: X30, UF090 (Rating 30 VDC, 0.9A, suitable for 24 VDC Circuits); PPTC Fuse: XX120, I-550 (Rating 120 VDC, 0.75A, suitable for 110 VAC Circuits)
- 2.4.8 Resistors and capacitors of appropriate capacity as per RDSO Specification no. RDSO/ SPN/ 144/2006 Rev. 2.0 or latest are also to be supplied for various signalling circuits. Resistors and capacitors should be of make as specified Annexure-VI of the Specification no. RDSO/SPN/165/2023 (Ver. 4.0) amnd. 1 or latest.
- 2.4.9 CO2 type fire extinguisher of capacity 4.5Kg as per IS Standard having ISI mark for all new relay room extension buildings at stations and service buildings at LC/IBH (2 Nos., per station & 2 no. per interlocked LC gate/IBH).

2.5 Telecommunication infrastructure:

- 2.5.1 All telecommunication works including survey, design, supply, installation, testing and commissioning for installation of KAVACH system shall be executed in accordance with the

provisions of the Indian Railway Telecom Manual. STM-1/ STM-4 along with 24F OFC is available in the entire section.

2.5.2 Telecommunication works in connection with installation of KAVACH system including survey, design, supply, installation, testing and commissioning shall be executed in accordance with the provisions of the Indian Railway Telecom Manual.

2.5.3 The scope includes the supply installation testing & Commissioning of 4x48 Fibers OFC Network with path Diversity in ring protection manner connecting all station KAVACH, RIUs and LC/IB KAVACH in ET-MKP, entire Katni complex, BNSP-OHAN, MHDA-NKJ-‘A’ cabin, KMZ-MAKR, STA-REWA, KMA-SAGM, section as per RDSO Spec. No. RDSO/SPN/ TC/110/2020 Revision-0 or latest amendments.

2.5.4 Construction of Manhole chamber size 1 M dia. and 600 mm deep as per approval of Engineer in-charge. (Including supply of pre-cast Ferro Cement pre-fabricated joint box) Drawing no. SK/DRM (S&T)/JBP/OFC/10, 11 and Drg No. WCR/Tele/06/05.

2.5.5 Supply and installation of ETSI heavy duty rack of size 2.2mtr (42U) height x 600 width x 600 depth of President/ Selrack/Raychem RPG/Shakti or similar make only with following: 1. Front tinted glass door of full height with lock. 2. Rear MS door of full height with lock. 3. Side panel louvered up to 1/3 height from bottom. 4. Top & bottom cover. Fan housing unit 4. Fan position along with 2 fan of 230 V AC 90 CFM for cabinet cooling. 5. "19" Mounting angles & cable entry provision from top & bottom. 6. Rack in grey powder coated finishing on external & internal surfaces. 7. Set of Castors- 2 Nos with brakes & 2 Nos without brakes. Accessories to be including with Rack: Earthing kit: 01 No., Cable management manager vertical & horizontal(1U): 2 No., Cable trays 100mm: 2 No., MCB mounting panel: 01 No., Vertical AC mains channel with 8 at each auto hut and station for 48 fiber FMS to be installed in 42 U rack.

2.5.6 Supply and installation of Fiber Monitoring System for monitoring 16 fibers (4 dark fibers from each cable i.e., 2 fibers from fiber no. 1 to 24 and 2 fibers from fiber no. 25 to 48) at each Station/IB hut/LC-Kavach Unit in ET-MKP section, entire Katni Complex and BNSP-OHAN, MHDA-NKJ-‘A’ cabin-MAKR, STA-REWA, KMA-SAGM section.

- (a) A Remote Terminal Unit for monitoring the 4 dark fibers comprising of 2 to 4 port optical switch and capable of monitoring 2 to 4 fibers at a time respectively and covering a monitoring distance of minimum 75 Km OFC network per optical Port. Equipment must be of 32 dB or more dynamic range with 2 to 8 port optical switch output. Powered from both DC 48V and AC 230V, 50Hz. RTU must be able to be fitted in existing 19" Rack. It should be able to generate wavelength of 1310nm or 1550nm or 1625nm for monitoring of fibers. Insertion loss must not be more than 1.5db and MTBF must be better than 6 million cycles. It shall also be operated in temperature range of 0 deg C to 50 deg C. Separate RTUs to be provided for monitoring of Fiber cables from each path.
- (b) **FMS (Fiber Monitoring Software / Application** software for monitoring optical fiber network) server application with Google Conduita) Basic Fault Management Module for detecting the fault in the optical fibre under surveillance and provide the optical distance and corresponding surface distance of the fault identified) Map Integration Module displaying fibre route in GIS / Google map and display the visual indication of the faults on the map) Network Analysis Module for analysis of the optical fibres under surveillance and provide trend analysis

- d) Report Generation Module for customizable report generation e) Modem Interface for SMS based alarm escalation for escalation of alarms through SMS to registered users as defined by admin f) Fibre Database Designer Module g) As Built Drawing / GIS Integrator Module h) Configuration Module i) Fault restoration Updating Module for tracking of restoration and updating of the restored fibres j) Interface with customer NOC for Trouble Ticketing k) Integration with Field Mobile Application Module
- (c) Server -RAID architecture + Database Server + Online UPS -Hewlett Packard Enterprise (HPE DL360 Gen10 plus Server) 1 X Intel (Intel Xeon Gold 6334) DDR4 SDRAM with ECC 16 GB, upgradable to 32 GB / CISC (x86) architecture / 8 cores/ 3.6GHz/12Mb Cache/ 2 Sockets available on Server & 1 Sockets populated with Processors available on Server/ Rack Form Factor (1 RU) /Type of Interface Type-SATA SSD(Read Intensive with Hot Swappable feature, 8 Slots, 960 GB SATA SSD per Slot capacity)/ Raid level 1,5,6/ 8 controller port/ 12GPSC Port Speed/ 4 GB Raid Cache/ 1200W Platinum Hot power supply/ Windows server 2008/2012 R2 or latest/ My SQL standard edition/ Support Ipv4/Ipv6/Network Card 1G, 10G/ BIS Registered or similar/better configuration compatible with the system and online UPS + Battery for atleast 4 Hrs of Backup on full load. Server shall be supplied with minimum 3 years warrantee. Any problem arised in Hardware and/or Software during warrantee period of the system shall be replaced/repared free of cost by the contractor.
- (d) Workstation Industrial grade Desktop computer with minimum 3 years warrantee for Control office - Processor Intel Core i9 12th generation or better, 16 core, 5 GHz, 32 GB DDR-5 RAM, 1 TB SSD, Operating System: Windows 11 or above - MS office 2021 or better included, MS Project Licenced Version, Quick heal total Security for 3 years or similar - USB Keyboard (Wired), Optical Mouse - Must be supplied with A-3 size colour inkjet all in one Printer-Suitable UPS for 60 minutes backup - Items shall be equivalent or superior to the specifications. To be supplied at KTE and JBP.
- (e) GSM Modem + SIM with 1 year from date of commissioning of complete project - GSM modem with RS232 cable and antenna - Supports AT command - Powered by 12V adapter.
- (f) Installation & Commissioning (RTUs, FMS Server Application Software loading in Server Machine, Mobile client units and EMS.
- (g) Onsite Training of "Monitoring of OFC equipment" and other subsystems at different locations (Training Period 100 Man days)
- (h) The contractor shall also provide live monitoring of various equipments including but not limited to routers and switches utilized in forming the networks necessary for station-to-station communication and NMS in addition to fiber monitoring system.

2.6 Tentative Requirement of Tower (40 m) in ITARSI- MANIKPUR (ex), MAHDEIYA (ex)-BINA MALKHEDI, Entire KATNI Complex, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR – OHAN (ex) section

- 2.6.1 Based on the RSSI survey conducted by the Authority, 40 m tubular Lattice towers have been planned as per RSSI survey report given in Annexure:2A. The location of the towers may be changed so as to ensure continuous radio coverage & overlapping radio coverage between adjacent towers. At such locations, where there is no Station/LC/IBS is nearby but Tower is to be provided for continuous coverage, S&T Service Buildings [as per Annexure-1B (Drg. No. JBP/S&T/P/TCAS/SB)], general lighting arrangements, Class-A protection, perimetric ring earth, Stationary KAVACH system, Power supply arrangement for radio equipment and Stationary KAVACH system by providing 2X10 KVA AT (except sr. no. 3, 31 & 33 where 2X25 KVA AT supply is to be provided) with CLS panel and mini IPS arrangement shall be provided. The scope shall also include termination of 2x48 F OFC (1x48F OFC from either side of the track which is being terminated at every station, LC, IBH) in 48F FDMS, laying and termination of 2X24 fiber OFC in path diversity from new service building to tower in 24F FDMS with suitable housing arrangement, provision of concrete cable route marker and RFID markers in both trenches from new service building to Tower with minimum 3 nos. in each path- both ends and at least one in middle depending on the length of trench path. Details of such locations where Towers are required for Continuous communication but there is no Station/LC/IBS is present nearby are given as under:

S.No.	Section	Latitude	Longitude	Remarks
ET-JBP Section				
1	GRO-4.35 Kms	22.6276	77.9093	
2	JHT(Class D Stn)-5 Kms.	22.7831	78.6368	
3	BNE-4Kms	22.9139	78.9548	2X25 KVA AT to be provided
4	Karapgaon (Class D stn)-3.85 Kms	22.9220	79.0296	
STA-KMA Section				
5	TZR-4.5 Kms	24.2172	82.5161	
KTE-SGRL Section				
6	GNDI-2.5Kms	24.5481	81.1376	
7	GAJB-5.75Kms	24.0502	82.2379	
8	SGAM-3.5Kms	24.0228	82.1654	
9	SSGJ-4.8Kms	24.0371	82.0628	
10	SKBR (Class D stn)	24.1038	81.8694	
11	MWJ-4Kms	24.0694	81.6644	
12	JOBA-4.5Kms	24.0970	81.7755	
13	Karapgaon (Class Dstn)-6.5 Kms	23.9985	81.6190	
14	BEHR-4Kms	23.9903	81.3790	
15	CTJ-3.5Kms	23.9913	81.2407	
16	BARA (Class D stn)-3 Kms	24.0007	81.184	
17	Damoy(Class D stn)-4.10Kms	23.9713	80.9978	
18	MFQ-3 Kms	23.9427	80.8924	
19	KHBJ-4.70Kms	23.8768	80.7298	
20	SLHA-6Kms	23.7717	80.5643	
21	LEK (Class D stn)-3.75Kms	23.7589	80.5283	
KMZ-BINA Section				
22	SAO-4 Kms	23.7948	79.8111	
23	GTY-5 Kms	23.7979	79.5753	
24	GEA- 4 Kms	23.8586	79.6352	
25	KYX- 4 Kms	23.8369	79.6352	
26	PHA - 4 Kms	23.9194	79.1546	
27	GAJ -3 Kms	23.8885	79.0441	
28	RTZ 2Kms	23.8328	78.6521	

29	RTZ -8 Kms	23.8659	78.6117	
30	ISH- 4.5Kms	23.9483	78.5130	
JBP-MKP Section				
31	SNRR (Class D stn)-3Kms	23.6087	80.3504	2X25 KVA AT to be provided
32	JKE-5kms	24.0205	80.4651	
33	KTHA-3.8kms	24.8376	80.8672	2X25 KVA AT to be provided
34	MJG-1.5kms	24.9258	80.8118	
35	BNSP-3kms	25.0721	81.0524	

2.7 Level Crossing Gates:

2.7.1 In ET-MKP section, there are total 102 LC gates out of which there are 25 Traffic gates, 41 Engineering Interlocked LC gates and 36 Engineering Non -interlocked LC gates.

Out of 25 Traffic LC gates, 16 Traffic LCs are proposed for closure shortly and rest 9 are also being planned for closure in the long run. Out of 41 Engineering Interlocked LC gates 21 LCs are proposed for closure shortly and rest 20 are also being planned for closure in the long run. As these 66 LCs (Interlocked (Traffic + Engg.)) are not closed yet, these have been shown in the approved SIPs. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. Revised SIPs will be issued accordingly. If these LCs are not closed, associated KAVACH work like provision of RIU with OFC connectivity in ring protection manner with adjacent Station/LC KAVACH or provision of LC KAVACH with associated RF communication tower at these LCs will be provided depending upon the existence of these LCs in RF communication zone. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C.

Similarly, out of 36 Engineering Non-interlocked LC gates, 24 LCs are proposed for closure and rest 12 are also being planned for closure in the long run. If these LCs are closed before executing KAVACH works, no associated KAVACH work at these LCs are required to be done. If these LCs are not closed, associated KAVACH work like provision of RFID Gate tags at these LCs will be done. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C. Details of LCs of ET-MKP section is attached below.

(Table: E)

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms	Engg/Traffic	I/NI
1	B	227	B	GRO-SQL	756/3-4	TRAFFIC	I
2	B	230	B2	BGTA-GMD	782.776	ENGG.	I
3	B	231	SPL	GMD-SGP	790.938 (790/10)	ENGG.	I
4	B	232	SPL	GMD-SGP	793.888 (793/10)	TRAFFIC	I
5	B	234	B1	SGP-PPI	805.35	ENGG.	I
6	B	237	B1	PPI-BKH	817.78	ENGG.	I

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms	Engg/Traffic	I/NI
7	B	239	B1	PPI-BKH	823.103	ENGG.	I
8	B	241	B1	PPI-BKH	827.989	ENGG.	I
9	B	242	SPL	PPI-BKH	830.636	TRAFFIC	I
10	B	243	C/M	BKH-SCKR	832.7	ENGG.	NI
11	B	245	B1	BKH-SCKR	836.7	ENGG.	NI
12	B	246	B1	BKH-SCKR	838/28-30	ENGG.	I
13	B	249	B1	BKH-SCKR	844.5	ENGG.	NI
14	B	250	B1	BKH-SCKR	846/19-21	ENGG.	I
15	B	251	SPL	BKH-SCKR	847/6-7	TRAFFIC	I
16	B	252	B1	SCKR-GAR	850.65	ENGG.	NI
17	B	254	B1	SCKR-GAR	853.15	ENGG.	NI
18	B	256	B1	SCKR-GAR	856.95	ENGG.	NI
19	B	257	B1	SCKR-GAR	858.45	ENGG.	I
20	B	258	SPL	SCKR-GAR	861/7-8	TRAFFIC	I
21	B	260	C1	GAR-BNE	865.84	ENGG.	I
22	B	261	C1	GAR-BNE	868.615	TRAFFIC	I
23	B	262	A	BNJH-BNE	871.75	TRAFFIC	I
24	B	263	SPL	BNE-KY	875/2-3	TRAFFIC	I
25	B	264	B1	BNE-KY	877/11-13 (877.350)	ENGG.	NI
26	B	265	B1	BNE-KY	878/29-31 (878.950)	ENGG.	NI
27	B	266	B1	BNE-KY	879/29-880/1 (879.950)	ENGG.	NI
28	B	267	B1	BNE-KY	881/4-6 (881.	ENGG.	NI
29	B	268	B1	BNE-KY	882/20-22	ENGG.	NI
30	B	269	B1	BNE-KY	884/23-25 (884.750)	ENGG.	NI
31	B	270	B1	BNE-KY	885/23-25 (885.750)	ENGG.	NI
32	B	273	B1	KY- NU	892.35	ENGG.	NI
33	B	275	C	KY- NU	901.738	ENGG.	I
34	B	278	SPL	NU - GPC	906/7-8	TRAFFIC	I
35	B	283	B1	GPC- BELD	917/1	TRAFFIC	I
36	B	284	C	BELD-KKB	920/8	ENGG.	I

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms	Engg/Traffic	I/NI
37	B	285	B2	KKB-SRID	922/5-6	TRAFFIC	I
38	B	286	C/M	KKB-SRID	923.75	ENGG.	NI
39	B	287	C/M	KKB-SRID	925.55	ENGG.	NI
40	B	292	A	KKB-SRID	934.7	ENGG.	I
41	B	293	C	KKB-SRID	935.8	ENGG.	NI
42	B	295	B1	SRID-BMR	942.3	ENGG.	I
43	B	299	SPL	SRID-BMR	954.1	ENGG.	I
44	B	300	C/M	BMR- BHTN	956.05	ENGG.	NI
45	B	301	SPL	BMR- BHTN	959/16-18	ENGG.	I
46	B	305	B2	BHTN-BRGT	965.5	ENGG.	I
47	B	307	A	BHTN-BRGT	968.33	ENGG.	I
48	B	308	C/M	BHTN-BRGT	971.95	ENGG.	NI
49	B	309	SPL	BHTN-BRGT	973/7-8	TRAFFIC	I
50	B	310	A	BRGT- KEQ	974/9-10	ENGG.	I
51	B	312	C/M	BRGT- KEQ	978.5	ENGG.	NI
52	B	316	SPL	KEQ-MML	985/25-27	TRAFFIC	I
53	B	323	B1	ADTL- DEO	1004.459	ENGG.	I
54	B	324	B	ADTL- DEO	1005.73	ENGG.	I
55	B	326	SPL	DEO-GSPR	1009.113	ENGG.	I
56	B	327	SPL	DEO-GSPR	1010/8-9	ENGG.	I
57	B	328	B2	DEO-GSPR	1013.973	ENGG.	I
58	B	329	C	DEO-GSPR	1015.350	ENGG.	NI
59	B	330	A2	DOE-GSPR	1017/1	TRAFFIC	I
60	B	331	SPL	GSPR- SHR	1019/6-8	ENGG.	I
61	B	332	SPL	GSPR- SHR	1020/22-24	ENGG.	I
62	B	336	SPL	SHR-DDCE	1029/4-5	TRAFFIC	I
63	B	338	B2	SHR-DDCE	1035.150	ENGG.	I
64	B	339	B1	SHR-DDCE	1037.675	ENGG.	I
65	B	340	C	SHR-DDCE	1041.450	ENGG.	I
66	B	341	C/M	DDCE- SBD	1044/1-2	TRAFFIC	I
67	B	342	SPL	DDCE- SBD	1047/30-32	ENGG.	I
68	B	343	A	DDCE- SBD	1050/28-30	ENGG.	I
69	B	344	B1	DDCE- SBD	1052/28-30 ((1052.836))	TRAFFIC	I
70	B	345	SPL	SBD- NWR	1054/24-26	ENGG.	I
71	B	346	SPL	SBD- NWR	1057.867	ENGG.	I

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms	Engg/Traffic	I/NI
72	B	347	SPL	SBD- NWR	1060.037	ENGG.	I
73	B	349	A	NWR-KTE	1068.87	TRAFFIC	I
74	B	350	C/M	NWR-KTE	1071.25	ENGG.	NI
75	B	351	C/M	NWR-KTE	1072.75	ENGG.	NI
76	B	353	SPL	NWR-KTE	1075.42	ENGG.	I
77	B	355	A	NWR-KTE	1078.193	TRAFFIC	I
78	B	358	A	PTWA- JKE	1091/16-18	ENGG.	I
79	B	360	A	PTWA- JKE	1097/0-1	TRAFFIC	I
80	B	368	C/M	PKRD- UDR	1115.550	ENGG.	NI
81	B	370	C/M	UDR- BUU	1120.650	ENGG.	NI
82	B	372	C/M	UDR- BUU	1124.700	ENGG.	NI
83	B	374	A	UDR- BUU	1130/9	TRAFFIC	I
84	B	375	SPL	BUU- MYR	1133.00	ENGG.	I
85	B	376	B1	BUU- MYR	1134/8-9	ENGG.	I
86	B	377	C/M	BUU- MYR	1139.25	ENGG.	NI
87	B	378	A	BUU- MYR	1141.885	ENGG.	I
88	B	380	C/M	MYR- UHR	1148.750	ENGG.	NI
89	B	381	C/M	MYR- UHR	1155.450	ENGG.	NI
90	B	382	SPL	UHR-LGCE	1158/30-32	TRAFFIC	I
91	B	388	C	STA-SGMA	1183/24-26	ENGG.	NI
92	B	389	C/M	STA-SGMA	1185/8	TRAFFIC	I
93	B	390	C/M	SGMA- JTW	1189/22-24	ENGG.	NI
94	B	391	C/M	SGMA- JTW	1191/8-10	ENGG.	NI
95	B	392	C/M	SGMA- JTW	1192.93	ENGG.	NI
96	B	395	C/M	SGMA- JTW	1202/11-13	ENGG.	NI
97	B	397	SPL	KTHA-CTHR	1213/8-9	TRAFFIC	I
98	B	399	C/M	MJG-TKYR	1230/26-28	ENGG.	NI
99	B	400	SPL	TKYR- MKD	1235/28-30	ENGG.	I
100	B	402	A	MKD-BQF	1241/31-33	TRAFFIC	I
101	B	402-A	C/M	BNSP-OHAN	1254/1-2	ENGG.	NI
102	B	403 A	SPL	BNSP- MKP	1254/2-3	ENGG.	I

2.7.2 In KTE-Bina section, there are total 30 LC gates out of which there are 10 Traffic gates, 15 Engineering Interlocked LC gates and 5 Engineering Non -interlocked LC gates.

Out of 10 Traffic gates, 6 Traffic LCs are proposed for closure in short run and rest 4 LCs are proposed for closure in the long run. Out of 15 Engineering Interlocked LC gates 12 LCs are proposed for closure in short run and rest 3 are proposed to be closed in the long run. As

these 25 LCs are not closed yet, these have been shown in the approved SIPs. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. Revised SIPs will be issued accordingly. If these LCs are not closed, associated KAVACH work like provision of RIU with OFC connectivity in ring protection manner with adjacent Station/LC KAVACH or provision of LC KAVACH with associated RF communication tower at these LCs will be provided depending upon the existence of these LCs in RF communication zone. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C.

Similarly, out of 5 Engineering Non-interlocked LC gates, 4 LCs are proposed for closure in short run and rest 1 LC is proposed for closure in long run. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. If these LCs are not closed, associated KAVACH work like RFID tags at these LCs will be provided. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C. Details of LCs of KTE-BINA section is attached below:

(Table: F)

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms.	Engg /Traffic	I/NI
1	D	310-A	SPL	MAKR-MDVK	980/9-10	ENGG.	I
2	D	4	B2	BJQ-KYE	989/7-8	ENGG.	I
3	D	6	SPL	BJQ-KYE	996/4-5	Traffic	I
4	D	7	SPL	KYE-SMRR	997/4-5	Traffic	I
5	D	8	SPL	KYE-SMRR	998/0-1	ENGG.	I
6	D	11	SPL	SMRR-JRK	1011/8	ENGG.	I
7	D	12	SPL	SMRR-JRK	1014/3-4	Traffic	I
8	D	16	A	ISH- NOI	1028/9-10	ENGG.	I
9	D	18	A	NOI- RTZ	1032/2-3	ENGG.	NI
10	D	20	SPL	NOI- RTZ	1036/6-7	ENGG.	NI
11	D	21	SPL	RTZ- SGO	1045/4-5	ENGG.	I
12	D	23	SPL	SGO- MKRN	1048/4-5	ENGG.	I
13	D	25	SPL	SGO- MKRN	1050/2-3	Traffic	I
14	D	26	SPL	SGO- MKRN	1050/7-8	ENGG.	I
15	D	27	SPL	SGO- MKRN	1051/1-2	ENGG.	I
16	D	29	SPL	SGO- MKRN	1054/0-1	ENGG.	I
17	D	32	SPL	MKRN-LDA	1059/2-3	ENGG.	I
18	D	45	SPL	GAJ-PHA	1099/2-3	Traffic	I
19	D	52	A	PHA-ANA	1113/1-2	Traffic	I
20	D	58	SPL	ANA-DMO	1126/1-2	Traffic	I
21	D	60	SPL	DMO-KYX	1128/3-4	ENGG.	I

22	D	62	A	DMO-KYX	1129/3-4	ENGG.	NI
23	D	65	SPL	DMO-KYX	1133/9-10	Traffic	I
24	D	67	SPL	KYX-BNU	1136/9-10	ENGG.	I
25	D	70	SPL	KYX-BNU	1141/5-6	Traffic	I
26	D	89	SPL	SYA-BQQ	1187/5-6	Traffic	I
27	D	94	C/M	SYA-BQQ	1196/0-1	ENGG.	NI
28	D	98	A	BQQ-REI	1202/4-5	ENGG.	NI
29	D	100	C/M	REI-PTHD	1206/1-2	ENGG.	I
30	D	102	SPL	REI-PTHD	1210/1-2	ENGG.	I

2.7.3 In KTE-SGRL section, there are total 04 LC gates out of which there is 01 Traffic gate, 01 Engineering Interlocked LC gates and 02 Engineering Non -interlocked LC gates.

All 4 LCs are proposed for closure in short run. As these 02 interlocked LCs are not closed yet, these have been shown in the approved SIPs. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. Revised SIPs will be issued accordingly. If these LCs are not closed, associated KAVACH work like provision of RIU with OFC connectivity in ring protection manner with adjacent Station KAVACH or provision of LC KAVACH with associated RF communication tower at these LCs will be provided depending upon the existence of these LCs in RF communication zone. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C.

Similarly, 2 Engineering Non-interlocked LC gates are proposed for closure in short run. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. If these LCs are not closed, associated KAVACH work like RFID tags at these LCs will be provided. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C. Details of LCs of KTE-SGRL is attached below:
(Table: G)

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms.	Engg/Traffic	I/NI
1	D	59	SPL	JOBA-MWJ	1236/3-4	Engg	NI
2	D	67	SPL	SKBR-NWB	1249/6-7	Engg	NI
3	D	88	SPL	SGAM-JAJB	1287/6-7	Engg	I
4	D	105	SPL	MZHL-BRGW	1321/6-7	Traffic	I

2.7.4 In STA-REWA section, there are total 07 LC gates out of which there are 02 Traffic gates, 04 Engineering Interlocked LC gates and 01 Engineering Non -interlocked LC gate.

Out of 06 interlocked LCs, 04 LCs are proposed for closure in short run and rest 02 LC is proposed for closure in the long run. As these LCs are not closed yet, these have been shown in the approved SIPs. If these LCs are closed before executing KAVACH work, no associated KAVACH work at these LCs are required to be done. Revised SIPs will be issued accordingly. If these LCs are not closed, associated KAVACH work like provision of RIU with OFC connectivity in ring protection manner with adjacent Station KAVACH or provision of LC KAVACH with associated RF communication tower at these LCs will be provided depending

upon the existence of these LCs in RF communication zone. Payment for KAVACH related work at these LCs (if not closed) is part of Schedule G1-C.

Similarly, 1 Engineering Non-interlocked LC gate is proposed for closure in short run. If this LC is closed before executing KAVACH work, no associated KAVACH work at this LC is required to be done. If this LC is not closed, associated KAVACH work like RFID gate tags at this LC will be provided. Payment for KAVACH related work at this LC (if not closed) is part of Schedule G1-C. Details of LCs of STA-REWA section is attached below:

(Table: H)

SN	Route	Gate No.	Class	Block section/Stn	Approx. Kms.	Engg/Traffic	I/NI
1	D	1	SPL	STA-KMA	1184/4-5	Traffic	I
2	D	2	SPL	KMA-SAKR	1190/7-8	Traffic	I
3	D	8	C/M	HNM-BGHI	1200/2-3	Engg	I
4	D	9	C/M	HNM-BGHI	1201/0-1	Engg	NI
5	D	11	SPL	HNM-BGHI	1203/7-8	Engg	I
6	D	17	SPL	TURKI-REWA	1219/0-1	Engg	I
7	D	18	B2	TURKI-REWA	1220/8-9	Engg	I

2.8 Power Supply arrangements:

- 2.8.1 Existing 110V DC supply at existing Stations/Interlocked LC Gates/IBS may be used for KAVACH equipments by providing suitable fuse/MCB, if spare capacity is available, otherwise capacity upgradation/augmentation of existing IPS has to be done. All other required supplies for the KAVACH equipments to be derived from the 110V DC supply made available. When the 110V DC supply is to be extended to another building for the use of KAVACH equipment, then at both ends Class-D SPD should be provided. At KAVACH Tower locations where there is no existing Stations/Interlocked LC Gates/IBH, 230V AC supply has to be made available by contractor through 2X10KVA AT with Auto changeover CLS panel. Contractor will also provide 110V DC supply for radio equipments and will have to make all other power supply arrangements also including provision of Class-B & C SPD as provided by Railways in existing IPS rooms. Since only one room is planned for construction at such locations, VRLA batteries of adequate capacity (in any case, it shall not be less than 80AH) shall be provided for KAVACH as well as OFC equipment's with adequate battery backup.
- 2.8.2 Up gradation of existing power supply at Stations and interlocked LC gates/IBH (By provision of additional Inverters/DC-DC converters etc. of adequate ratings with pre-wired mini cabinet/Chargers of required rating at stations and IBH/LC gates). To cater to additional power supply requirement, miniature IPS DCDP cabinet with required n+1dc dc converter sets is to be provided at the stations and IBH/LC gates. This miniature IPS shall be integrated with the existing IPS at the station by the contractor.
- 2.8.3 Power supply for UHF full duplex radio equipment (Hot standby) housed in RTU (Radio tower unit) mounted at RF tower including UHF antenna and Aviation lamp shall not be provided from Power supply used for indoor Kavach system. Separate Power supply

through Fuse and MCB to be used for Outdoor equipments (Radio equipments, Aviation lamp etc.) for Kavach of station/interlocked LC/IBH.

- 2.8.4 In case of new building contiguous with existing relay room building, 10 Sqmm multistrand single core PVC insulated confirming to RDSO specification IRS S 76/89 with latest amendments shall be used and in case of new building which is non-contiguous with existing relay room building, 12 Core Signalling cable shall be used and laid from existing IPS room to Station KAVACH unit for extending 110VDC power supply through suitable MCB arrangement.
- 2.8.5 The scope also includes augmentation of AT supply from 5KVA to 10KVA/25KVA as instructed by Authority engineer at all interlocked LCs/IB Huts where LC-Kavach is being provided.
- 2.8.6 SPD/ Surge protector shall be provided for surge protection of power supply equipment.

2.9 Earthing & Surge Protection Devices and associated works:

New Earthing arrangements to be provided at all such locations where new building is being constructed for Kavach works.

- 2.9.1 Earthing & Surge Protection Devices and associated works to be provided as per RDSO approved Drawings and RDSO Specifications no. RDSO/SPN/144/2006 with latest amendments (Safety and Reliability Requirement of Electronic Signalling Equipment) and TAN 3006 Ver 3.0 dated 08.01.2025 (Earthing bonding surge & lightning protection system for S&T installations) and RDSO/SPN/197/2012 with latest amendments (Code of practice for Earthing & Bonding system for signalling equipments).
- 2.9.2 Existing Ring earths wherever available at stations shall be connected to the Kavach Relay rack and Kavach equipment rack, otherwise new maintenance free earth for Kavach equipment shall be provided.
- 2.9.3 Supply Installation, testing and commissioning of Class-A Protection type Surge Protection system as per RDSO DRG/ drawing No. WCR/RLY/DRG.No.2015/02 Consisting of: - a) Active ESE Lightning conductor as per NFC17- 102. b) Should Provide Radius of Protection of 146 m Model No. LAPDX-250 or equivalent, tested from international HV test laboratory Certificate for the same. c) Issued to OEM of Lightning Conductor should be attached with tender. d) CE Certificate e) Authorization letter from OEM should be attached with tender. f) Stainless steel Material with pointed tip g) Delta T should be greater and equal to 96 Micro seconds. h) In house certificate from Manufacturer should be provided with material. i) It should be testable by means of external tester. j) GI mast 5m with adopter head and base plate for connecting ESE lightning conductor. k) Lightning non resettable type counter having 6 digits display of stainless-steel material having IP 65 protection manufacturer. Class A Protection is to be provided at all-new RR extension buildings at stations and LC/IB KAVACH & RIUs installed at new service buildings (as per Table: 1B)
- 2.9.4 Supply and installation of separate low maintenance earth for connecting Class-A protection as per RDSO specification No. RDSO/SPN/197/2016 Version 1.0 or latest at all RR extensions at stations (wherever new Relay room extension building are being constructed for Kavach)

- 2.9.5 Supply and installation of Perimetric / Ring earth (Annexure-8) at interlocked LC/IBS service building and RR extension at stations (where ever new building is being constructed for Kavach) comprising of minimum 8 No. Maintenance free earths connection in ring pattern as per latest RDSO/SPN/197/2016 Version 1.0 or Latest (with Latest Amendment along with BRC, MEEB, SEEB and associated cabling and Copper tapes. Supply of all requites material as per latest RDSO Guide Line.
- 2.9.6 Connecting existing Ring earth with Kavach equipments, Relay rack where ever Kavach work is being done in the existing Relay room only.

2.10 Automatic Fire detection & alarm system:

Automatic Fire Detection & Alarm System shall be provided at all new relay room extension buildings at stations, LC/IB/ Auto Huts wherever new building has been provided. Also, existing OFC huts of stations (Where RR extension is being done or Kavach related works are being done in OFC hut) where AFDAS has not been provided, new Fire Alarm system has to be provided. These should be integrated with the existing Fire alarm system either by augmentation of capacity of existing Fire alarm system or Integration of new DPs with existing control Panel of Fire alarm system. Minimum requirements of AFDAS is as below:

- 2.10.1 Supply, Installation, Testing and commissioning of addressable Fire alarm Control panel as per RDSO Specification **RDSO/SPN/217/2021 Rev. 3.0** with latest amendment.
- 2.10.2 Supply, Installation, Testing and commissioning of Manual call point as per RDSO Specification RDSO/SPN/217/2021 Rev.3.0 with latest amendment.
- 2.10.3 Supply, Installation, Testing and commissioning of addressable loop powered wall sounder Beacons as per RDSO Specification RDSO/SPN/217/2021 Rev3.0 with latest amendment.
- 2.10.4 Supply, Installation, Testing and commissioning of heat and smoke multi sensor as per RDSO Specification RDSO/SPN/217/2021 Rev.3.0 with latest amendment.
- 2.10.5 Supply, Installation, Testing and commissioning of Linear heat sensing (LHS) interface module for LHS cable as per RDSO Specification RDSO/SPN/217/2021 Rev.3.0 .
- 2.10.6 Supply, Installation, Testing & Commissioning of Analog Addressable Type Monitor Modules with in-built fault isolator or alternate arrangement which shall isolate the module in case of short circuit the module should have visual indication for its operation & complying to RDSO Specification RDSO/SPN/217/2021 (Rev. 3.0) with latest amendment. Operating temperature: -10 to 60 deg C, Humidity up to 85%, Approval-UL/LPCB Listed.
- 2.10.7 Supply, Installation, Testing & Commissioning of Analog Addressable loop powered Control module fitted with bi-directional in-built isolator providing two voltage free, single pole, change over relay output complying to RDSO/SPN/217/2021 Ver. 3.0 or latest.
- 2.10.8 Supply, Installation, Testing and commissioning of Linear heat sensing (LHS) cable as per RDSO Specification RDSO/SPN/217/2021 Rev.3.0 with latest amendment.
- 2.10.9 Supply, Installation, Testing and commissioning of Fire survival circuit integrity cable each lot having 200 Mtr. Cable with all accessories connecting of all fire alarm

devices as per RDSO RDSO/SPN/217/2021 Rev.3.0 with latest amendment. (Unit-Lots).

- 2.10.10 Supply, testing & commissioning of isolator device to isolate the circuit in case of short circuit, complying to the RDSO/SPN/217/2021 ver. 3.0 or latest.
- 2.10.11 The Automatic fire detection & alarm system provided at each hut that need to be networked.

2.11 Fuse auto changeover system:

Fuse auto changeover system shall be provided at all new relay room extensions buildings at stations LC/IB Huts wherever new building has been provided with following minimum requirements:

- 2.11.1 Supply, Installation, testing and commissioning of Fuse Auto changeover system (FACS) for vital fuses as per RDSO specification No. RDSO/SPN/209/2012 Rev.2.0 or latest.
- 2.11.2 Supply of Indicative Type of fuses of rating 0.6 A, 1.6A..
- 2.11.3 Fuse alarm system shall be provided at all new relay room extensions buildings at stations with wiring of potential free contacts with data logger.

2.12 Data Loggers:

- 2.12.1 All the new repeater relays potential free contacts of KAVACH system shall be wired with Data logger for continuous monitoring. Necessary upgradation/alteration in Data logger of specification IRS.S.99/2006 with additional 256 Digital inputs shall be done at all stations in ET-MKP(ex.), KMZ-MAKR, NKJ-‘A’-MHDA (ex), KMA-REWA and Entire Katni Complex by providing additional racks/cards if required. This includes programming of data logger for fault diagnostic in suitable structured language in consultation with Railway.
- 2.12.2 In all the stations where existing data logger has more than 250 spare contacts available, Kavach equipments/relays should be wired in these contacts only with programming of data logger for fault diagnostic in suitable structured language in consultation with Railway. No need for provision of additional digital input card at such stations. Details of Spare contacts of Data logger has been provided in Schedule-A.
- 2.12.3 Supply of Remote Terminal Unit (RTU) to monitor 128 Digital and 16 Analog inputs as per IRS: S99/2006 (Amd-3) or latest. With one number of inbuilt dual card leased line modem for networking purpose shall be provided. The RTU should be compatible for networking with existing NMDL system of JBP division. RTUs shall be supplied at each location where LC-Kavach is being provided in a separate building. New RTUs to be provided at all locations wherever new building is being provided for LC-Kavach. All the RTUs shall be networked and integrated with the existing Data Logger Network with necessary Hardware/Software.
- 2.12.4 Installations, wiring, testing and commissioning of Remote Terminal Unit (RTU) complete along with accessories with Contractors own wiring & fixing material, This includes loading of NETWORKING software and networking with data logger. This includes programming of RTU for fault diagnostic in suitable structured language in consultation with Railway.
- 2.12.5 Upgradation of existing RTU at interlocked LCs/IBHs to monitor all digital inputs of Kavach by providing additional cards if required and wiring of all digital inputs of Kavach. Upgradation of RTUs required only at those interlocked LCs/IBHs where Kavach

equipments are provided in existing Relay Rooms of interlocked LCs/IBHs.

2.12.6 The requisite channel/port for networking will be arranged by Railways.

2.12.7 Status of all the systems including redundant systems shall be monitored through Data logger. Exception reports/ alarms shall be sent to maintenance team & Signal Control for taking necessary action well in time before complete system failure.

2.13 Commissioning of 4x48 Fiber OFC backbone:

2.13.1 Testing and Commissioning of 4x48 Fiber OFC to provide path redundancy in ring protection manner for preventing breakdown on account of a single OFC cut/failure and facility for remote monitoring and maintenance of the OFC network. The scope also includes but not limited to supply of HDPE duct, single mode 48F OFC, OFC joint chambers, OFC joint closures, 48F Fibre Distribution Management System, 42 U Rack, OFC patch cords, connectors etc. and supply of completion drawings- (i) Cable Route Plan, (ii) Fibre Termination Plan, and (iii) Power Supply Termination Plan etc.

2.13.2 The scope includes Supply, installation, testing and commissioning of sliding type FDMS (48 input and 48 output) for OFC as per RDSO specification No. RDSO/SPN/TC/37/2020 Rev.4.0 or latest amendment and suitable for mounting in a 19" 42U rack of APW/Valrack/HCL/Rittle make or similar. It shall provide management of 48 numbers of fibers of armoured optical fiber cable. It shall also provide facility for reconfiguration, expansion and testing. This shall be of compact in design, easy in handling and its constructed structure shall be inherently robust and rigid for all conditions of operation, replacement, storage and transport. Bend radius of Pigtails, patch cords and optical fibers in installed condition should be better than 70 mm dia.

2.13.3 The scope includes Supply and laying of 40 mm outer diameter and 33 mm inner diameter Blue and Green colour Permanently Lubricated HDPE duct as per Specification no. RDSO/SPN/ TC/45/2013, Rev.2.0, with latest amendment for each 48 fiber OFC where Blue color and yellow color HDPE ducts shall be used for laying UP side short haul and long haul OFC cables respectively and Green color and orange color HDPE ducts shall be used for laying DN side short haul and long haul OFC cables respectively in different trenches with route diversity in ITARSI- MANIKPUR, Entire KATNI Complex, BANSAPAHAR – OHAN, SATNA-REWA, KAIMA-SAGMA, KMZ-MAKR, NKJ- 'A' cabin-MHDA section as per extant cable laying practice of WCR/ guideline on signalling cable laying issued by RDSO (Annexure-10).

2.13.4 Separate HDPE duct is to be laid for each Optical Fibre Cable, i.e., 4 OFC HDPE ducts will be laid. 01 HDPE duct for 1X48 Fiber OFC each.

2.13.5 4X48 fibers Optical Fiber Cable shall be terminated in Relay Room at each station. Necessary telecom equipments and housing equipments also to be provided.

2.13.6 2x48 F OFC i.e. 1x48 fiber OFC of each side of the track will get terminated at every Interlocked LC gate / IBH in block section as well as at every station (Only 24 fibers of each 48 fiber cable have to be terminated at every Interlocked LC gate /IBH and rest 24 fibers will get through). Remaining 2x48 fiber OFC i.e. 1x48 fiber OFC of each side of the track will get terminated at every station only and not at mid-section LC gate/IBH. These fibers shall be

distributed and terminated in such a way that any single/double fiber cut shall not lead to disruption of Kavach system.

- 2.13.7 2X24 Fiber OFC (1x24 Fiber in separate trench) with path diversity shall be laid from existing Relay Room to OFC cable Huts at each station.
- 2.13.8 4x48 Fiber OFC (1x48 Fiber in separate trench) with path diversity shall be laid from JBP RRI/station to JBP division Control office.
- 2.13.9 Separate FDMS has to be provided for each 1x48 Fiber termination at each station, Interlocked LC gate, IBH.
- 2.13.10 As automatic signalling work is also proposed in the ET-MKP section, OFC loop of minimum 100 meters is to be provided at each Auto hut location. Planned Auto hut locations in ET-MKP section has been provided as Annexure-14
- 2.13.11 Typical Scheme for OFC termination shall be provided by the contractor and approval of Authority/Authority Engineer shall be obtained before execution of work.
- 2.13.12 Fiber Monitoring System has to be provided for continuous monitoring of 16 dark fibers (4 dark fibers from each Fiber cable i.e., 2 fibers from fiber no. 1 to 24 and 2 fibers from fiber no. 25 to 48).
- 2.13.13 Cable laying shall be carried out as per the extent specifications and RDSO guidelines issued on 04.02.2014 vide letter no. RDSO/SIG/2010, Indian Railway Telecom Manual and PCSTE/WCR Technical circulars.
- 2.13.14 Air Test/Duct Integrity test shall be conducted before blowing OFC and report to be submitted to the Authority/ Authority's representative/Authority Engineer.
- 2.13.15 Detailed OTDR/Power meter/any Optical source test reports of 4x48 Fiber OFC laid in ITARSI- MANIKPUR, Entire KATNI Complex, BANSAPAHAR-OHAN, KMZ-MAKR, NKJ'A cabin-MHDA, STA-REWA and KMA-SAGM section shall be prepared and submitted before and after laying of OFC in for approval of the Authority/ Authority's representative /Authority Engineer.
- 2.13.16 Fixing of RCC cable route marker and RFID markers over cable route at every 50 meter, fixing of GI pipe on culverts, bridge, Preparation of cable way 300 mm wide at the bottom and 300 mm deep in rocky area and refilling the same (after cable laying) with concrete mixture of proportion of 1:3:6 and grouting the ends at either side of the rocky portion using concrete mixture with contractors own cement and other materials.as per Drg. No. SDO/Cable Laying/008. This includes critical track crossings, road crossings, spans in station yard through HDD boring at the depth of 2-3 meter in 120 mm outer dia and 103.5 mm inner dia HDPE pipe as per site conditions and as per instructions of Authority/Authority's representative Engineer/Authority Engineer. This also includes supply of armoured 48 Fiber OFC cable as per RDSO Spec. No. RDSO/SPN/ TC/110/2020 Revision-0 or latest, OFC blowing (through OFC blowing machine), splicing of OFC in the entire section ITARSI- MANIKPUR, Entire KATNI Complex, BANSAPAHAR – OHAN, KMZ-MAKR, NKJ 'A cabin-MHDA, STA-REWA and KMA-SAGM section and termination at all Stations/IBH/LCs/RIU.

2.13.17 All Schemes, Plans, Drawings and Documentations are to be submitted for approval of the Authority/ Authority's representative/ Authority Engineer before implementation of the same in the field.

2.13.18 All types of loading, unloading & transportation of materials, including cables, and miscellaneous items required as per site requirement and instruction of Authority/Authority's representative/Authority Engineer.

2.13.19 On completion of above works, testing and commissioning of entire system in totality shall be carried out by the Contractor.

2.13.20 KAVACH on UHF backbone system: -

- (a) UHF- duplex radio communication unit with hot standby provision shall be used by Stationary KAVACH to communicate with Loco KAVACH equipments.
- (b) 2x24 fiber optical cable to be laid with path diversity from R/R (S-KAVACH) to Tower location. Fibers to be terminated at R/R and Tower location as per requirement.
- (c) The scope includes Supply and laying of 40 mm outer diameter and 33 mm inner diameter Permanently Lubricated HDPE duct as per Specification no. RDSO/SPN/ TC/45/2013, Rev.2.0, with latest amendment for each 24 fiber OFC in different trenches with route diversity from each Stationary Kavach/LC-Kavach location to RF Towers.
- (d) Detailed OTDR/Power meter/any Optical source test reports of 2x24 Fiber OFC laid as above.
- (e) Termination of fiber shall be done using FDMS which is supplied, installed by Contractor at Stations/ OFC Hut/IBH Kavach location/LC Gate Kavach Location/RIU Location as planned after Detailed Survey.
- (f) The scope includes breaking of Platform, building foundation, brick masonry work for entry of cables at Stations/OFC hut/ IBH Kavach location/LC Gate Kavach Location/RIU Location. This also includes repairing of the same to the original state.
- (g) On completion of above work, testing and commissioning of entire system in totality shall be carried out by the bidder and submit report.
- (h) Supply, fixing and GPS mapping of RFID Cable route markers along the trench at every 50 meters (Minimum of 3 each path depending on the length of path).
- (i) Supply, fixing and GPS mapping of RCC Cable route markers along the trench at every 50 meters (Minimum of 3 each path depending on the length of path).

2.14 Cable laying and associated works:

2.14.1 Cable laying to be done as per provisions and drawings as given in Signal Engineering Manual (APPENDIX-II Chapter 15) for Signalling cables and Indian Railway Telecom Manual for telecom cables, PCSTE/WCR technical Circulars and extant specifications and RDSO guidelines.

2.14.2 OFC/Quad cable/Power/Signalling cable for KAVACH work should be laid with diverse route facility on both side of track.

2.14.3 Digging of 1.20 Meter deep and 0.3-Meter-wide trenches including clearing of roots of trees and bushes and temporary obstruction on these selected routes. **Note:** In case were digging of trench up to 1.20 Meter deep and 0.3-meter wide is not possible, the depth can be reduced as per site conditions with the approval/ directions of the Authority Engineer of the works.

- 2.14.4 All works of excavation of cable trench 1.0 Meter deep, 0.3 Meter wide on pucca platform/on Road for road crossing and restoration of the platform/ Road surface need to be refilled by the contractor to original condition after laying of GI/DWC pipes.
- 2.14.5 Supply and laying of permanently lubricated HDPE pipe of size 40/33mm as per technical specification RDSO/SPN/TC/45/2013 rev. 2.0 for OFC Laying, blowing of 24/48 Fiber OFC cable as detailed above.
- 2.14.6 Back filling and consolidating of cable trench first for 5 CM (in case where bricks are to laid over cables) after laying of cables and then complete back filling & ramming of loose soil as per the technical specifications.
- 2.14.7 Concrete Cable route markers and RFID Markers with inbuilt GPS (Specs) 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 RCC route marker for OFC shall be as per provisions and drawings as given in Signal Engineering Manual (APPENDIX– II Chapter 15) for Signalling cables and Indian Railway Telecom Manual for telecom cables.
- 2.14.8 Transportation of HDD machine with accessories including handling of store materials, preparation of site and boring for placing of 120mm/103.5 mm permanently lubricated HDPE silicon duct for crossing of OFC at bridges / culverts / track/ pucca road /congested area/swampy areas as per site requirement and as per direction of site Supervisor.
- 2.14.9 **All 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 size of pipes depending on the total number of cables will be crossed. The depth of horizontal boring should be minimum 2-meter up to 3.0 meter from rail flange/road level/ ground level as per direction of Authority/Authority Engineer. This item will be used for track crossing of running line, road crossing, water logging area or any obstruction and circulating area. By using self-lubricated HDPE pipe of 120mm outer dia and 103.5mm inner dia in the bore and laying of cable in the bore under the track/road/circulating area.
- 2.14.10 Supply of galvanized perforated G.I pipe of dia of minimum 100 mm. for laying of OFC/Quad/Signalling/Power cables and fixing on girder bridges including supply of connecting sockets, channel angle iron bracket unit for support at an interval of one meter, nuts and bolts of proper sizes and including laying of cable inside the pipe. All materials as required for the work shall be supplied by the contractor.
- 2.14.11 Supply and fixing of GI pipe 100 mm dia. to carry all the cables with fixing materials and making necessary entry arrangement at relay room extension buildings at stations, LC Gates, IBHs and other locations decided by the Authority Engineer/Authority Engineer's representative at the time of actual working. Necessary materials including Gi pipe to be supplied by the contractor.
- 2.14.12 Protection works for cable laying on Steel Girder Culvert/ Bridge & PSC Girder Bridge using duct of 80 mm dia for Steel Girder Bridges/ Culverts with 1:2:4 masonry work

- for PSC bridge. Necessary materials including duct of 80 mm dia. To be supplied by the contractor.
- 2.14.13 Excavation of cable trench on pucca platform and placing of GI pipe, 100 mm dia and restoration of the platform surface to the original condition after cable laying and refilling the trench as per site condition. Necessary materials to be supplied by the contractor.
 - 2.14.14 Cutting of solid rock making channels 150 mm wide at the bottom X 200 mm deep by chase cutting & refilling the same after laying of required telecom/signal cables in channel (laying of telecom cables will be paid under different items of schedule) with concrete mixture of portion 1:3:6 with 30 mm Graded stone aggregate and grouting the end at either side of rocky portion using concrete mixture with contractor's own cement, sand ballast, Water and other materials.
 - 2.14.15 Cutting of all types of roads/platform (1 meter X 300 mm)/(300 mm X 300 mm) and refilling after laying of RCC/GI/DWC pipe and restoring them to original condition. This also includes transportation and laying of any no. of DWC/RCC/GI pipes as per requirement. The work shall be done as per the extant practice of WC Railway and instructions of Railway Site Engineer. If GI pipes are used for cable laying on steel girder Culvert/ Bridge, perforated GI pipes to be used.
 - 2.14.16 Supply and fixing of Concrete Cable Marker as per provisions and drawings as given in Signal Engineering Manual (**APPENDIX –II Chapter 15**) for Signalling cables and Indian Railway Telecom Manual for telecom cables. The cable route marker shall be provided at every 50 mtr distance approximately and also a bending /turning point of the cable route, Jointing/Splicing locations. (Station RR to Tower both paths minimum 3 each path- both ends and at least one in middle depending on the length of trench path)
 - 2.14.17 Supply, installation & GPS mapping of RFID based electronic cable/ pipe marker 22.5 Cm dia (+/-0.5%) 1.5 mtr depth range, 10-digit hexa decimal ID code 101.4 KHz freq. Make- Stanley/Komplex or equivalent. The cable route marker shall be provided at every 50 mtr distance approximately in ET-MKP section, BNSP-OHAN, KMZ-MAKR, NKJ'A Cabin-MHDA, STA-REWA and KMA-SAGM section and entire Katni complex along each line and also at bending /turning point of the cable route, Jointing/Splicing locations etc. Specifications as per **Annexure-3**.
 - 2.14.18 Supply of 11 no. of RFID marker locators each at PPI, NU, JBP, KTE, STA, MJG, BEHR, BRGW, SGO, DMO and MAKR for 8000 marker record, built in GPS Module, 1.5 m depth range 4*20digit LCD display for 101.4 KHz Freq. As per specification attached (**Annexure-3**). Make- Stanly/Komplex or equivalent. (Station RR to Tower both paths minimum 3 each path- both ends and at least one in middle depending on the length of trench path)
 - 2.14.19 Two nos. of trenches (UP & DN side) should be done throughout the section for laying 4x48F OFC (2x48F OFC in each side of the track with path diversity in separate permanently lubricated HDPE duct)

- 2.14.20 **Supply of 01 no. GNSS based cable route tracer kit at JBP with Pathfinder High Power Pipe and Cable locating kit** (Bluetooth enabled to transfer data to Mobile App) with DA2 GNSS RTK receiver, with RTX performance based on Catalyst Correction service for up to 2cms horizontal / 5cms vertical accuracy & Mobile App for data acquisition of GNSS coordinates of route traced and depth data and digital map generation, including cloud data backup & map output in .kml, AutoCAD, .csv. Pathfinder PLDL receiver with 36 user configurable Active multi frequency options including 200Hz, 512Hz, 797Hz, 815Hz, 8kHz, 33kHz, 65kHz, 82kHz, 200kHz up to 476.2kHz, passive detection @50Hz for power cables, Radio Mode for locating metallic utilities whether energized or not, Live Current measurement, LCD Display with left-right arrow function, Modes: peak, peak with arrow, pin point peak and null modes, Compass function; Live Depth measurement. Supply includes locating Bluetooth enabled Pathfinder PLDL receiver, Transmitter (Max power : 12Watt with high power output $\geq$ 130Volts) with Li-ion Rechargeable Batteries for both Transmitter & Receiver, Battery charger, GNSS receiver with pre-configured RTX Catalyst correction service for accuracy as mentioned above(with 3 years license), Dual Bluetooth mobile phone with pre-loaded Mobile App & cloud access for real time map generation (with 5 years license from date of commissioning of the complete project). Make: Stanley/Komplex/3M/Rycom or similar for Pathfinder PLDL Cable Route tracer (Warranty: 3 years from date of commissioning of the complete project), DA2: Stanley/Komplex/Trimble/3M or similar (Warranty: 1 year from date of commissioning of the complete project)
- 2.14.21 The available existing cable route plan has been uploaded on IREPS along with tender document. Before starting the trenching work in Section, cross trenching shall be done by the contractor at the interval of every 50 meter in station section & at every 100 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. Cross trench should be done in such a way to identify all existing cables to prevent any cable cuts.
- 2.14.22 Manual trenching is preferable in station section. JCB should be used with utmost precautions in station sections for trenching and other related work only after Joint survey of existing cables, Pipe lines etc. and Cross trenching with the approval of Authority engineer.
- 2.14.23 Trenching from JCB is preferable in block sections. However, JCB to be operated on cable route only after identifying all existing cables through Cross trench and Joint survey. Manual trenching should be done in the area where trenching from JCB is not possible due to site conditions. Work should be done under the supervision of Authority engineer.
- 2.14.24 Joint survey is to be done before starting the trenching work to identify all existing S&T Cables, Electrical Cables, Pipe lines, Drains etc.
- 2.14.25 WCR drawing for laying of Signalling, Quad and OFC cable has been uploaded on IREPS along with tender document has to be followed for this work.

- 2.14.26 Instructions for cable laying, Damages to cables, Joint survey etc. issued vide WCR policy circular no. जबल/एन.एच.क्यू.120/पॉलिसी/टी-1/पार्ट-v दिनांक 10.01.2024 shall be strictly followed.
- 2.14.27 Micro-tunnelling/trenchless laying shall be carried out at a depth of not less than 1.5 m from natural ground level.
- 2.14.28 Track crossing, road crossing, platform crossing, trenching in circulating area shall be carried out by micro-tunnelling/trenchless laying to the extent possible.
- 2.14.29 Micro-tunnelling / trenchless laying shall also be adopted in difficult terrains / marshy areas / water logged areas if it is found advantageous for quick delivery of this Project. Requirement of such micro-tunnelling / trenchless laying not envisaged during survey shall be decided by the Authority Engineer.
- 2.14.30 Wherever micro-tunnelling / trenchless laying is not feasible for track crossing, road crossing, platform crossing, horizontal boring in accordance with WCR Practice shall be done.
- 2.14.31 Wherever both micro-tunnelling/trenchless laying and horizontal boring are not feasible for track crossing, road crossing, platform crossing, manual track crossing shall be carried out.

2.15 Survey, Design, Drawing and Documentation:

- 2.15.1 Design of detailed design scheme as per approved SIPs as provided by West central Railway & RDSO/ IRSEM/ OEM guidelines. Submission of complete drawings and designs of Kavach system at stations, LCs/IBHs, Automatic Signalling Relay Huts, for approval & wiring. Also changes/ addition/ alteration of existing wiring of existing installations such as alteration/ modification/ addition in interlocked LCs/IBHs/relay rooms, data logger, RTU, etc.as will be required to be done during the work. All necessary hardware and software as also design shall be executed under this tender.
- 2.15.2 Final location survey of cable route, design and preparation of cable route plan, Termination plan, jointing and taping chart of ITARSI- MANIKPUR, Entire KATNI Complex, BANSAPAHAR – OHAN, SATNA-REWA, KAIMA-SAGMA, KMZ-MAKR, NKJ- 'A' Cabin-MHDA section as per code of practice for installation and commissioning of Signalling and Telecom cable "Approved drawing and documents shall be supplied by contractor in 06 hard copies (spiral binding with plastic lamination) along with 2 Pen Drives in Auto CAD of latest version.
- 2.15.3 This includes (but not limited to) KAVACH TOC, RFID Tag Layout, RFID TIN layout, RFID Tag data, Relay room floor plan, Relay rack detail chart, contact analysis chart, power supply diagram, Fuse particulars, Power distribution plan for KAVACH, CTR details if any, Location particulars if any, Track bonding plan if any, Wiring diagrams for PI & RRI (for alteration only), Wiring diagrams for ABS huts, IBs/LCs, Panel diagram for station/LCs and VDU diagram (if altered), Stationary and Loco KAVACH interface diagrams, and other manuals as specified in the tender document and as per RDSO specifications. Note: -After getting approval from Railways all the above diagrams/plans to be done in "Auto CAD" & soft copies submitted. In addition to these diagrams/plans are to be submitted in

polyester film tracing along with 6 sets of Ferro prints of the same.

- 2.15.4 All design drawings shall be submitted in soft as well as hard copy.
- 2.15.5 Design of modifications, preparation and supply of “AS PLANNED” and “AS LAID” Signalling Circuits and Plans/ Documents for installations as per the standard practices and extent instructions, for the type of Interlocking and Signalling suiting to the yard layout given in the Signalling Plan of the stations/ End Panel/ Cabins/ sections/ huts/LC/IBH as per the scope of the work or added subsequently.
- 2.15.6 Design, Preparation and supply of AS PLANNED AND AS LAID Outdoor Signalling documents (cable route plan, cable core chart, location box particulars if any, panel particulars if any, fuse particulars, track bonding diagram if any, numbered wiring diagrams, relay index, contact analysis, posting of contacts in wiring diagrams, simulation panel particulars, data logger & RTU particulars, relay rack, rack details, resistor condenser particulars, power equipment wiring, power equipment foot print diagram, etc as per requirement). Supply of 6 sets of final hard copy of the approved circuit diagrams and the documents mentioned above along with contact analysis in A2, A3, and A4 sizes as required with 1 set of prints on tracing film and a soft copy on Pen Drive to be supplied. (Arranging rexine cloth bound booklets and binding for large and small sizes of drawings).
- 2.15.7 Completion document for KAVACH with Relay/ Electronic Interlocking shall be submitted within 60 days from the date of commissioning. Completion documents shall include:
- a) Signal Interlocking Plan (Completion copy after site verification)
 - b) Kavach TOC
 - c) RFID Tag Layout
 - d) RFID Tag Data
 - e) TIN layout & TIN number allocation.
 - f) Interface circuits.
 - g) Station application data & Station number allocation.
 - h) Relay Room Floor Plan & Equipment Rack details
 - i) Relay rack detail chart,
 - j) Contact Analysis Chart
 - k) Data logger particulars
 - l) Data Logger Validation Particulars
 - m) Fuse particulars
 - n) Cable Route Plan
 - o) Cable corage plan
 - p) Power distribution Plan, lightening, surge protection & earthing plan for Kavach
 - q) CTR details if any.
 - r) Location particulars if any
 - s) Track Bonding Plan (if altered)
 - t) Wiring diagrams for PI and RRI (For alteration only)
 - u) Wiring diagrams for ABS huts, IBH/LCs.
 - v) Panel Diagram for station and LCs, VDU diagram (If altered)
- 2.15.8 Supply of completion documents/drawings (six sets for each Location) in A3 size and

supply and fixing of laminated maintenance flow chart, , troubleshooting chart, Do's & Don't in A2 size in Relay room and Maintenance room or as per instruction of the Authority / Authority's representative/Authority Engineer for all stations/LC gates/IBH/Auto Signalling Location huts.

- 2.15.9 GM/PCSTE/EIG sanction papers along with all dispensations (including dispensations to be obtained from Railway Board/CRS) will be prepared & submitted by contractor to railway and railway will submit further to the authority for sanction/dispensation application for RB/CRS/GM/PCSTE/EIG Sanction for commissioning of Kavach work.

2.16 Any other requirements of Signalling and Telecommunication:

- 2.16.1 Supply of 11 nos. kit for configuring, programming and downloading RFID Tag data.
- 2.16.2 Supply, Installation and commissioning of 04 nos. kit for configuring, programming and downloading execution and application data for Station KAVACH equipment.
- 2.16.3 Supply, installation and commissioning of 01 nos. Test Bench for Station Kavach equipment at JBP Control office.
- 2.16.4 Supply, installation and commissioning of 01 no. Network Management System for Centralized monitoring of station KAVACH and Loco KAVACH equipment as per as per RDSO/SPN/196/2020, Ver. 4.0 or latest. at JBP Control office. Drawing attached as Annexure-4.
- 2.16.5 All servers, including KAVACH NMS servers, shall be provided in a 1+1 configuration in hot standby mode, with spatial diversity and geographical survivability and a dedicated power supply in redundant manner to prevent total shutdown in the event of a single server failure, fire in one server room, or other similar incidents.
- 2.16.6 The Agency shall ensure the uninterrupted availability of the NMS portal and the functionality for report extraction on a 24x7 basis. Any fault or malfunction in the NMS reporting system shall be promptly attended to and promptly rectified by the Agency within the shortest possible reasonable time to ensure minimal disruption. The Agency shall take all necessary measures to maintain the reliability and operational efficiency of the NMS portal at all times.
- 2.16.7 Further, the Agency shall customize NMS reports, SMS alerts, pop-ups on the NMS portal, and alarms to facilitate prompt preventive maintenance and efficient fault diagnosis and rectification of the Kavach system in a user friendly manner. This customization shall cover both station infrastructure and locomotives operating within the ITARSI-MANIKPUR, MAHDEIYA-BINA MALKHERI- MAHADEOKHERI, Entire KATNI COMPLEX, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA- SAGMA, BANSAPAHAR- OHAN section of Jabalpur Division, ensuring interoperability with other approved OEMs. All customizations shall be carried out in strict compliance with the instructions of the Authority Engineer to guarantee seamless and reliable operations.
- 2.16.8 The hardware requirements for the Network Monitoring System (NMS) are as follows:
- (a) Server RAID architecture: Dell PowerEdge T40 or better with Intel Xeon E-2224G

Processor, 32GB RAM, 2TB DATA, 800GB SSD, DVD-RW, DOS, and a 3-Year Warranty. Two such servers shall be installed, with the NMS data logged onto each server. Online UPS + Battery for minimum 4 hour backup on full load.

- (b) Windows Professional Server 2019 or latest to be installed on both servers.
- (c) Shared Firewall to be configured on both servers.
- (d) Mechanical Keyboard and Mouse for operational use.
- (e) The PC configuration for NMS console shall include an Intel i7 Core processor or superior (13th generation or later), 16 GB RAM, 2 TB SSD storage capacity to accommodate 90 days of data and a Nvidia GeForce RTX 4090 (8GB) or better. The operating system shall be Windows 11 or a higher version.

2.16.9 Supply of 11 nos. A3 printer with scanner (all in one type) for printing NMS fault and exception reports for NMS at JBP Control office and 02 nos. Laser Jet Printer for Office use for printing tag-data, RFID plans etc. make HP LaserJet 1020 or similar.

2.16.10 Supply, Installation and commissioning of 02 Nos. Lab Models of station equipment, loco equipment, trackside components and simulator at JBP Control office.

2.16.11 Setting up of KAVACH FAT setup at Katni (previously ADSTE/P/KTE chamber). Necessary construction/renovation of all rooms including arrangement of un-interrupted power supply, arrangement of electrical fittings and appliances also has to be provided including sufficient capacity power back-up. Drawing attached as Annexure-5

2.16.12 Setting up of KAVACH FAT setup at Jabalpur. Necessary construction of building including arrangement of un-interrupted power supply also has to be provided including sufficient capacity power back-up. Annexure-4.

2.16.12 A Factory Acceptance Test (FAT) Procedure for Stationary KAVACH Application Logic as per RDSO/SPN/196/2020, Version 4.0 and as approved and issued by RDSO vide letter no. RDSO-SIG0KVCH(GEN)/2/2024 dated 28.01.2025 shall be followed.

2.16.13 Construction of Two Kavach rooms of minimum size with provision of additional toilets on the top floor of TRO/TRD office building in the DRM JBP office campus. (Annexure-4).

2.16.14 Display system of minimum size 85 inch (4K resolution) for continuous monitoring of Kavach system shall be installed with redundancy in existing S&T Control room with connection to the NMS in redundant paths or as per instructions of Authority/Authority representative (Annexure-6).

2.16.15 Supply and fixing of laminated maintenance flow chart, Do's & Don't in A2 size in Relay room and Maintenance room, troubleshooting charts etc on 118 Sqmm thick Kodak photo paper with lamination of various sizes with different lettering in English & Hindi separately in required size as per the instructions of Authority/Authority Engineer for troubleshooting and maintenance to be provided at appropriate locations.

2.16.16 Supply of 10 Nos. MECO electronic earth tester make MECO model no 4680B/higher version or similar for Railway use.

- 2.16.17 Supply of 22 Nos. Clip On Meter MECO 2700 Model or equivalent with similar features for Railway use.
- 2.16.18 Supply of 05 Nos. digital insulation tester: Specification range 50V-1000V DC, Voltage 25V-600V AC/DC, Continuity, Low ohms and storage memory last 50 reading with fuse blown indicator. Make Rishab/ Meco/Fluke for Railway use
- 2.16.19 Supply of 10 Nos. Hand held Multimeter 4.5, Measurement range: True RMS: 40000 [Model: Fluke 287 or similar] for Railway use.
- 2.16.20 Supply of 05 Nos. portable Cable fault locator (Metallic Time Domain Reflectometer) suitable in RE/Non-RE Railway territory with all accessories for locating faults such as loop and break in various twisted pair cable such as underground telecom quad cables, signalling cables, telephone jelly filled cables, LAN etc for Railway use. Inspection to be done by RITES.
- 2.16.21 Supply of 05 Nos. Cable (route) locator - RIDGID make model SR-20 or similar for Railway use. Inspection to be done by RITES/TPI agency.
- 2.16.22 Supply and Installation of Location Boxes and associated works if required.
- 2.16.23 Supply of 218 Nos. Reclining Chair for use at various KAVACH locations of Godrej/ Jauri/ Nilkamal/Dechathlon make or similar for Railway use.
- 2.16.24 Supply of Visitor Chair, size total height 825 mm, depth. 570 mm, seat height 460 mm., under structure canti lever type MS CRCA tube 1.6 mm thick, hot pressed ply wood with steel T-Nuts for rigid fastening single piece integral skin PU arm rest. Quality tapestry. High density PU model cushion. All steel components are epoxy powder coated after seven tank anti corrosion treatment of surface. Make Godrej or better.
- 2.16.25 Contractor shall ensure that:
- a) A section should cover Objective of Project, A System Overview and Scope of Works.
 - b) A section should cover Project Planning and Project Management requirements which stipules requirement of various management plans such as, but not limited to, Signal Interlocking Plan, Document Management Plan, Design Management Plan, Interface Management Plan, Procurement Plan, Site Management Plan, Quality Assurance Plan, Testing & Commissioning Management Plan, RAMS Management Plan, Training Plan and Defect Liability Management Plan.
 - c) A section should cover Project Program requirements which stipules requirement of various works program such as Overall Works Program, Design Submission Program, Procurement Program, Installation Program, Testing & Commissioning Program and Training Program. This should also include mechanism of monitoring progress through Progress Reports and Progress Review Meetings.
 - d) A section should cover Design Requirements which stipules various design criteria and design specification to be followed by Contractor while preparing design under the project. It should also cover list of design & documents to prepared by Contractor. It should also stipulate various stages of design and procedures to be followed for review and approval of design .
 - e) A section should cover interface requirements for System Design, Installation and Testing & Commissioning.

- f) A section should cover technical requirements which stipulates various standards and specification of cables, equipment, material, items & accessories to be followed in project.
- g) A section should cover system requirements which stipulates requirements related with overall system architecture.
- h) A section should cover requirements which stipulates various standards, guidelines, procedures, methods to be followed during supply, storage and laying, construction and installation of cables, equipment, material, items & accessories in the project.
- i) A section should cover testing requirements. This should cover various stages of testing such as factory, supply, storage, installation, system acceptance etc. This should cover agency responsible for such testing and procedure to followed during such testing.
- j) A section should cover requirements related with RAMS. This should also include requirements of redundancy and spare capacity in the system.
- k) A section should cover requirements related with Training for Authority's Personnel.
- l) A section should cover requirements related with Spares to supplied to Authority's Personnel.
- m) A section should cover requirements related with Operation & Maintenance Documents. These documents include Operation Manual, Technical Manuals, Maintenance Manuals, As Built Drawings etc.
- n) A section should cover requirements related with Defect Liability Period.

2.17 BUILDING REQUIREMENTS-Interlocked LC gates/IBH service buildings:

- (a) Exhaust fans to be provided with anti-theft arrangement in IPS and battery room.
- (b) All electrical fittings to be provided should be energy efficient and ISI/BIS marked
- (c) Two steps to be provided around the wall in Battery Room for placing batteries.
- (d) Cable duct size (450 mm x 600 mm) with concrete slab cover shall be provided in equipment room.
- (e) Earth terminal connected with reinforcement at plinth level should be properly earthed.
- (f) Height of the structure from floor level to roof level should be minimum 3 meters.
- (g) The level of the building should be kept at least 2 feet above rail level. This level shall be kept in view of highest flood level (HFL) in Absolute/Automatic Signalling Section.
- (h) False ceiling is not recommended.
- (i) Flooring should be finished with anti-skid Vitrified tiles.
- (j) Stair case with railings is also to be constructed (if required as per instructions of Authority / Authority's representative/Authority Engineer) for access into the building from trackside and/or from approach road side.
- (k) Supply, erection, testing & commissioning of 100 W LED (Automatic Light Sensor based) street light fittings suitable for 230V AC, 50 Hz comprise a single piece deep drawn aluminum housing IP-65 colour temp 5500-7000K with connection etc. with suitable fixtures and clamps etc.– Minimum 2 no. at each building and as per instructions of Authority/ Authority's representative/Authority Engineer.
- (l) Heat resistant terrace Tiles (300mmX300mmX20mm) with SRI >78, Solar Reflection > 0.70 and initial emittance>0.75 on waterproof and sloped surface of terrace to be provided.
- (m) All weather proof thick emulsion paint to be provided on all outer walls.

2.18 BUILDING REQUIREMENTS – RR extensions at stations:

- (a) All electrical fittings to be provided should be energy efficient and ISI/BIS marked.

- (b) Supply, erection, testing & commissioning of 36 W LED street light fittings suitable for 230V AC, 50 Hz comprise a single piece deep drawn aluminum housing IP-65 colour temp 5500-7000K with connection etc. with suitable fixtures and clamps etc. – Minimum 2 no. at each building and as per instructions of Authority/ Authority's representative/Authority Engineer.
- (c) Cable duct size (450 mm x 600 mm) with concrete slab cover shall be provided in equipment room.
- (d) Earth terminal connected with reinforcement at plinth level should be properly earthed.
- (e) Height of the structure from floor level to roof level should be minimum 3 meters.
- (f) The level of the building should be kept at least 2 feet above rail level. This level shall be kept in view of highest flood level (HFL) in Absolute/Automatic Signaling Section.
- (g) Flooring should be finished with anti-skid Vitrified tiles.
- (h) Stair case with railings is also to be constructed (if required as per instructions of Authority/ Authority's representative/Authority Engineer) for access into the building from trackside and/or from approach road side.
- (i) Heat resistant terrace Tiles (300mmX300mmX20mm) with SRI >78, Solar Reflection > 0.70 and initial emittance>0.75 on waterproof and sloped surface of terrace to be provided.
- (j) All weather proof thick emulsion paint to be provided on all outer walls.

3.0 Technical Specification of Signalling and Telecom materials:

SN	Description	Minimum Specification with Latest Amendments/ Drawing
1	MSDAC with Dual Detection	RDSO/SPN/176/2013(Ver3.0) or latest Amendment
2	UFSBI for ABS Huts and Stations	IRS Spec. No IRS:S-104/2012 Ver. 0 (Latest Amendments)
3	Signalling 12 core 1.5 Sq. mm Copper Conductor PVC insulated Armoured Unscreened, Under Ground cable.	IRS:S-63/2014(Rev.-4) or latest.
4	Cable Power 2 core 25 Sq. mm Aluminum Conductor PVC insulated Armoured Unscreened, Under Ground cable.	IRS:S-63/2014(Rev.-4 and Amd. 1.0) or latest & IS: 1554 (Part-1) or latest.
5	6 Quad Cable Jelly filled.	IRS: TC 30/05 (Ver.1) with Amendment No. 5 or Latest.
6	Reinforced Thermo shrinking Jointing Kit for 4/6 quad jelly filled cable (TSF-4) for derivation 2T & straight through joints.	IRS:TC-77/2012, (Rev.1) (Amdt. -2 or latest)

7	24/48 fiber Armoured optic fiber cable.	RDSO Spec. No. RDSO/SPN/TC/110/2020 Revision-0 or latest.
8	Optical Fiber Cable Joint enclosure.	Raychem / 3M or better.
9	FDMS	RDSO/SPN/TC/37/2000 Rev. 3 Amdt 2 or latest Make: RNM/ Tyco/ D-Link or similar.
10	Supply of PIJF telephone cable 20 pair, 0.63 mm dia. Copper conductor Armoured.	IRS:TC-41/97
11	SMPS based IPS system suitable for LC Gates with 300 AH VRLA Battery (55+5 Nos. of Cell)	RDSO/SPN/165/2023 (Ver. 4.0) with latest amendment.
12	Colour light signal post tubular steel 140 mm dia, as per IRS 56/81, Length 3.5m-5.5 m long, as per requirement,	IRS S 6/81, SA 23002 A/M
13	Signal base	RDSO Drg.S2011/M
14	Foundation for Colour Light Main Signal Post in the ratio of 1:3:6 Aggregate not exceeding 3:8 cm.	Drg . No. WCR/S&T/SIG/01, Galvanized Anchor bolts & nuts conforming to IRS Drg. No. SA-116 A/M
15	Four aspect Colour light signal unit non-metallic complete made of FRP/Metallic	RDSO/SPN/194/ 2006 Ver.1, RDSO/SPN/151/1997 & RDSO Drg No. SA-23001 A/M (Adv), or all to latest amendments / SPECIFICATION No. IRS: S 26-64 2020 Ver1.1 for metallic Type.
16	FRP/ Metallic Direction type route indicator.	RDSO/SPN/194/ 2006 or latest, SA 23401-06/ SPECIFICATION No. IRS: S 26-64 2020 Ver.1.1 for metallic Type.
17	FRP/ Metallic Calling-On signal unit complete With fixing clamps, terminals etc.	RDSO drawing SA- 24351 (Adv.) Alt-1 but Without lamp, lamp holder and lens. SPECIFICATION No. IRS: S 26-64 2020 Ver 1.1 for metallic Type.
18	Fabrication, supply and fixing of 'P', 'C', 'A', 'G' etc. retroreflective marker of approved colors, on signals.	RDSO Drg. No. SA-23456
19	Signal aspect LED signal unit, 110 VAC	RDSO/SPN/199/2010 Rev 1.0 or with latest amendment.
20	Apparatus cases Full made of 10 SWG sheets with miniature E Type Locks.	IRS:S 30/64 & RDSO Drg. No. SA 3376 with Latest amendments.

21	Excavation, ramming, Casting Cement Concrete foundation for Full Apparatus cases/ Location boxes in the ratio of 1:3:6 Aggregate not exceeding 3 :8 cm.	Single case as per Drg No. JBP/S&T/C/084, Half case as per Drg No. JBP/S&T/C/085 Galvanized Anchor bolts & nuts (also referred to as foundation bolts) conforming to IRS Drg. No. SA-116 A/M
22	Earth pipe complete	Drawing No. WCR RLY No T2014/1 & Drawing No. WCR RLY No T2014/5
23	PVC insulated multistrand 35 Sq. mm. Cu Cable for connecting earth bus bar to earth electrode.	IS: 694 or latest, RDSO Drawing SDO/ RDSO/ E&B/ 001 or Latest.
24	Earth connection to Location Boxes and Signals With MS flat.	RE drawing no. CORE/ S&T/ ALD/ SK/592/ 2008 or latest.
25	Copper Tape 25 x 2 mm for interconnection of Earth electrodes.	RDSO Drawing SDO/RDSO/E&B/001 Or Latest.
26	Cable Termination rack.	As per extant practice on W. C. Rly. Rack arrangement shall be as per sketch SK-727 as per the drawing attached.
27	16/ 0.2 mm size tinned flexible single core indoor wire PVC coated in different color as per technical specifications.	IRS:S-76/89 Amend. No. 2 or with latest amendment/ specification.
28	PVC insulated Rly Signalling Indoor 40 core 0.6 mm cables as per/ specification to be used.	IRS (S) 76/89 amendment II or with latest amendment.
29	Relay Rack	As per extant practice on W.C. Rly. Typical part list as per Annexure-9 and Rack arrangement as per Sketch no Sk-727 and Rack plan as approved by Engineer in charge.
30	Disconnect Terminal block for Four conductor with screwless Cage Clamp type/ sliding switch disconnect for each conductor size up to 2.5 sq. mm. Equivalent to M6 Terminals.	RDSO Specification No. RDSO/SPN/189/ 2004 version 3.0.
31	Power wire (copper, multistrand) 0.85 conductor each dia 0.30 +/- 0.01 with insulation thickness of 1.2 mm nominal conductor resistance 3.30 ohms / km	IS 2465/1984 & IS 694/1990 (1x6 Sq.mm), Test Parameters as per IRS (S) 76/89.
32	Power wire (copper, multistrand) 140 conductor each dia 0.30 +/-0.005 with insulation thickness of 1.2 mm nominal conductor assistance 1.815 ohms / km.	IS 2465/1984 & IS 694/1990 (1x10 Sq. mm) and test parameters as per IRS (S) 76/89.

33	Power wire (copper, multistrand).101 Conductors each dia 0.45 +/-0.01 with insulation thickness of 1.20 mm nominal conductor resistance 1.21 Ohms / Km.	IS 2465/1984 & IS 694/1990 (1x16Sq.mm) test Parameters as per IRS(S) 76/89.
34	Fuse Block Made of PBT /Polycarbonate.	IRS:S 75/2006 & RDSO Drg No. SA-23748 Alt-4.
35	Non deteriorating type low voltage cylindrical Head cartridge Electric fuse2A.	Spec No. IRS / S / 78 / 2006 with latest amendments.
36	Concrete cable route marker	SDO/Cable Laying/020.
37	Supply and installation of Earth Leakage Detector comprise of 4 (four) channels: 2 channel 110 VAC and 2 channel 24/60 VDC in all ABS HUTs.	RDSO specification No. RDSO/ SPN /256/ 2002.
38	HDPE Duct	RDSO/SPN/TC/45/2013 Rev2.0.
39	Apparatus cases (Half) made of 10 SWG sheets With miniature E Type Locks.	Drg No JBP/S&T/C/085
40	Electronic interlocking	RDSO/SPN/192/2019 ver. 2.0 or latest

3.1 LIST OF SIGNALLING SPECIFICATIONS (IRS/BRs)

Specification No.	Description
IRS:S-105/2012 (Ver.0)	Block Proving By Axle Counter (BPAC) using UFSBI (For double line and single Line)
IRS:S-104/2012 Ver.0	Universal Fail safe Block Interface.
IRS:S-22/2016 Ver 1.0	Double Line Block Instrument.
RS:S-32/66	Push Button Type Single Line tokenless Block Instrument.
IRS:S-98/2001(Amd.3)	Single Line Tokenless Block Instrument Handletype.
IRS:S-32-66	Push Button TLBI with UFSBI.
IRS:S-68/89	Filter Unit for Use in Conjunction With Block Instrument in 25 KV 50Hz,Ac Traction Areas.
IRS:S-76/89(Amd.3)	PVC Insulated Railway Signalling Indoor SingleCore Cable.
IRS:S-76/89(Amd.3)	PVC Insulated Railway Signalling Indoor MultiCore Cable.
IRS:S-63/2014(Rev.4.0)	PVC Insulated Armoured, Unscreened, Underground Railway Signaling Cable.
IRS:S-26/64 DrgNo:SA-23840(Adv.)	Colour light Signal Unit/Housing: Multi Unit Type -Without Side Light & Colour light SignalUnit/ Housing: Shunt Signal-Position Light Type.
IRS:S-66/84Amd.1	Colour light Signal Unit/ Housing: Route Indicator Direction Type 5 Lamps Unit Arms (1 To 6 Way)
IRS:S-49/74(Amd.1)	Electric Point & Lock Detector.
IRS:S-21/2001	Electric Key Transmitter.
IRS:S-24/2002(Amd.-1)	Electric Point Machine (Non-Trailable Type)
IRS:S-37/2022 ver 2.0 (Amd.3)	Motors For Electric Point Machine.
IRS:S-78/2006	Non-Deteriorating Type of Low Voltage Electric Fuses For Railway Signalling.
IRS:S-77/2006(Rev.1)	120/160/200 Way TAG Blocks For Signalling Installations.
IRS:S-75/2006(Rev.2)	ARA Terminal Blocks and Fuse Blocks-Made ofPBT/ Polycarbonate.
IRS:S-79/92(Amd.2)	Multi way Isolating Terminal Blocks (Barrier Type) For Signalling Installations.
IRS:S-86/2000(Amd.4)	Battery Charger For Railway S&T Installations.
IRS:S-89/2013Ver.1.0	Track Feed Battery Charger.

IRS:S-93/96 (Amd.1)	Valve Regulated (Sealed) Lead Acid Stationary Battery Charger for Railway S&T Installations.
IRS:S-91/2014Ver1.0	Transformer – Rectifier Set For Railway S&T Installations.
IRS:S-95/96(Amd.1)	SITEL ‘Primary Cells’ (Dry, Avalanche Type) For Railway S&T Installations.
IRS:S-88/2004	Low Maintenance Lead Acid Stationary Secondary Cells For S&T Installations.
IRS:S-93/96(A) (Amd. 1	Valve Regulated (Sealed) Lead Acid Stationary Battery for Railway S&T Installations.
IRS:S-72/88(Amd.2)	TRANSFORMER 230/ 110 V , 1KVA to 5 KVA
IRS:S–96/2000	DC-DC Converter For Railway S&T Installations
IRS:S-82/92(Amd.2)	Inverter For Railway Signaling Installations For ‘On-Line applications.
IRS:S-74/89(Amd.6)	Ferro Resonant Type Automatic AC Voltage Regulator For Railway Signalling Installations.
BRS:941ASTS/E/RELAYS/ AC LITLED SIGNAL/09-2002, Amdt.-1	Relays - Universal Plug-in type AC Lamp Proving Relay (M-to-C Contact) for LED Signal Lamp.
BRS:930& BRS:931A	Relays -‘Q’ Series Neutral Line (ACI & NON-ACI)
BRS:938A,939A,966 & Appendix F2 For 9 Ohm.	Relays– Plugin Type, Track Relay 9 & 4 Ohm (ACI & Non-ACI)
BRS: 930, 931A, 932A, 933A,934A,935A,937A,943,960	Relays–Special Type (Metal to Carbon)
IRS:S-46-74 Amd-1	Relays - Neutral Line (Metal-to Metal Contact) , (ACI &Non-ACI) Relays – SpecialType (Metal to Metal) Relay-Metal to Metal 110V AC LED ECR for LED Signal Lamp.
IRS:S-46	Relays–Point Contactor Unit.
IRS:S-31/80(Amd.1)	Relays –3-Position DC Polarized (Metal to Metal)
IRS:S-67/85(Amd-3)	Relay Contacts–SIG– (For ‘Q’ series plug-in type relays only)
IRS:S-61/2000(Amd-3)	Fail Safe Electronic Time Delay Device for Railway Signalling.
IRS:S-65/83(Amdt3)	Choke Coil for single rail track circuits on 25 KV50 Hz Ac electrified sections.
IRS:S-40/84withAmdt.1	Nylon Insulated Joints.

IRS:S-99/2006(Amdt-3)	Data logger system for Railway S&T Installations.
RDSO/SPN/153/2011Rev. 4.1	LED Signal-Lighting Units for Railway Signalling.
RDSO/SPN/199/2010Rev1.1	LED Signal Lamps For Main Color Light SignalFor Railway Signalling.
RDSO/SPN/200/2010Rev-2.0	Battery operated LED Based Flashing Tail Lampfor Railway Vehicles.
RDSO/SPN/201/2010Ver.2.0	Fog Pilot Assistance System for Safety (Fog Pass)
RDSO/SPN/189/2004Rev.3.0	Modular Terminal Blocks, Fuse.
RDSO/SPN/165/2023 (Ver.4.0) with latest amendments.	SMPS Based Integrated Power Supply (IPS)
RDSO/SPN/256/2002	Earth Leakage Detector.
RDSO/SPN/197,Ver.1.0	Code of practice for earthing and bonding systemfor Signaling equipments.
RDSO/SPN/173/2002(Amdt-2)	Fail- safe electronic flasher device.
RDSO/SPN/146/2001	Audio Frequency Track Circuit.
RDSO/SPN/177/2012(Ver.3)	Single Section Digital Axle Counter.
RDSO/SPN/177/2012(Ver.3)	High Availability Single Section Digital Axle Counter.
RDSO/SPN/191/2005(Ver.0)	DTMF Based Block Bell and Telephone Equipment.
RDSO/SPN/176/2013Ver.-3	Multi Section Digital Axle Counter.
RDSO/SPN-168/2005Rev.2	Thermo plastic Poly Urethane Insulators for Railway Signalling.
RDSO/SPN/192/2019 Ver. 2.0	Electronic Interlocking.
RDSO/SPN/196/2020 Ver.-4	KAVACH (Train Collision Avoidance System) (TCAS)
RDSO/SPN/213/2014Ver.1.0	Advanced Auxiliary Warning System (AAWS)
RDSO/SPN/208/2012(Ver 2.0) With out hand generator.	Electric Lifting Barrier.
RDSO/SPN/217/2021 Ver. 3.0	Automatic Fire Detection & Alarm system for S&T installations.
RDOS/SPN/209/2012 Rev 2.0	Fuse Alarm/ Fuse Auto changeover system for usein Railway Signalling.

*****End of S&T Part*****

Electrical (TRD) specification and special condition

1. Provision of 10 kV, 25 kV/240 V, single phase step down, oil filled natural air cooled Auxiliary transformer for automatic block signaling huts and 10 kVA, 25 kV/240 V, single phase step down, oil filled natural air cooled Auxiliary transformer for LC gate Service Buildings (Being constructed for conversion of non-Interlocked to Interlocked LCs) between ET-KTE section (Double line) section, power Supply will be drawn by provision of AT Supply from existing-OHE network. ATs, Auto Changeover Panel & associated equipments of RDSO approved source shall be provided. Shifting of PTFE neutral section due to provision of KAVACH.
2. **Electrical License:-** For participating in tender for an electrical nature of work, the contractor shall have to possess valid Electrical License of appropriate voltage issued by any State Government under clause 45 of compilation of rule of Indian Electricity rules 1956 or as amended from time to time. Electrifications of 11 KV and above including OHE, "A" class electrical contractor license is essential. (ii) The license can be possessed with one of the partners or in his own name if sole proprietor. Firm should submit a self- attested copy of the electrical contractor license along with the offer; otherwise, the offer will be summarily rejected.
- 3 The contractor can carry out the work either himself, if he has valid electrical license or through specialist sub-contractor who has a valid electrical license. The Bidder must give undertaking that either he is having minimum requisite experience (valid electrical license) himself or he will be deploying specialist subcontractor. If the contract is awarded to the bidder and he himself does not have requisite experience as above, he is required to enter into legally enforceable agreement with the specialist sub-contractor at least one month prior to scheduled starting of Key activity as per program submitted by him as contractor and agreed by the authority. The agreement must specify the specific role and responsibility of the subcontractor.
- 4 The electrical work should be carried out under the supervision of Electrical Department. Necessary measurement of works executed shall be entered by Authority Engineer.
- 5 The bill passing will, however, be done by representative of authority engineer. However, the final payment will be released after satisfactory completion certificate of work executed by officials who has recorded the measurement.

NOTE: - Item no. 1 & 2 above are as per JPO WCR/N-HQ/150/Wks/Policy-17/Part VII dated 08.09.22.

Specification

1.0 DRAWINGS, TECHNICAL DATA AND EXPLANATORY NOTES

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 equipments, materials, fittings and components will be subject to 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. The scope of works and specifications item wise of all schedules are given below: -

1.1 : Survey of site and preparation of design and drawings: -

The contractor shall have to prepare the cable route plan in consultation of Railway Engineer of every station /LC gate. Full details of ATs, Auto changeover panel, cable crossing, cable trenches, cross sectional details; other features of station shall be clearly shown. The location/station wise drawings shall be got approved from Sr. DEE/TRD/JBP & Dy. CSTE/P/JBP before starting the work. After completion of the work the contractor shall submit four copies of as erected cable route plan duly approved for distribution to Division.

2. (a): Supply, erection, oil filtration, testing and commissioning of LT supply transformer 10 kVA of 25 kV/230 V:-

This shall cover supply, erection, testing and commissioning of 10 kVA of 25 kV/230V LT supply transformer complete with terminal connectors as per RDSO specification No. ETI/PSI/15 (8/2003) with latest version, on the mast/ gantry. It shall also cover supply and erection of retro reflective number plate of Rly. approved design. This 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 equipments, as well as power supply required for the same. All necessary tools, equipments, instruments required to carry out oil filtration / checks/tests/ commissioning shall be arranged by the contractor. Note- The replacement/Top up of the transformer oil on account of testing and leakages during the warranty period shall be done by the contractor at his own cost.

3. Cement concrete foundation in hard and rock soil:

The price shall cover excavation, supply of cement and handling of all materials, and accessories, temporary arrangements for excavation in hard soil and concrete/ masonry drains/walls requiring use of chisel and hammer or requiring blasting , shoring where necessary, casting concrete including form-work where necessary, tamping of the concrete, grouting of mast and finishing the top of concrete foundation or anchor blocks. The price also include 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 and removal of spoil. The Purchaser's engineer shall be informed in advance where use of chisel and hammer or blasting has been necessary.

The contractor shall arrange for supply of explosive and all tools and plants for blasting operations at his own cost. The price shall also include the diversion of drains if found. The price shall include the cost of cement.

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 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 grade ordinary port land 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 15Cm.cubes by works test: -

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

NOTE: -

i) Test specimen shall be taken at the site of work from 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 to IS:456/2000 or latest (curing period will be 28 days).

4. Cement concrete foundation in other than hard and rock soil:

The price shall cover excavation, supply and handling of all materials and accessories, temporary arrangements for excavation in other than hard and rocky soil. 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 10cm., and removal of spoil. NOTE: Nominal reinforcement will be necessary proper ramming in black cotton soil foundations. Such

nominally reinforced foundations in black cotton soil will be payable under item 6. The steel for nominal reinforcement will be arranged by the Contractor and the concrete mixture, in such a case shall be as per ISS 456 with latest amendment.

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 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 mugging:-

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 mugging 53 grade ordinary port land 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 15Cm.cubes by works test: -

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

NOTE: -

- I. Test specimen shall be taken at the site of work from mixture of concrete
- II. 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.
- III. Age will be reckoned from the day of castings.
- IV. Curing of re-inforced concrete will be done in accordance to IS: 456/2000 or latest (curing period will be 28 days).
- V. The prices shall be same for any shape or size of concrete blocks. In calculating the individual volume of concrete, fraction of a cubic meter beyond the third decimal shall be rounded off to the next nearest third decimal.
- VI. The prices shall apply for concreting of all foundations for mast, gantries, portals anchor blocks for guy rods, and fencing uprights.
- VII. For purposes of computation of volume of concrete, the volume of steel work embedded in the foundation block and mugg shall be ignored.
- VIII. Cost of all concrete will be paid for only, the price shall inclusive of filling of concrete cubes at each 50 cubic meters of foundation &

shall be tested from recognized laboratory.

- IX. For purposes of computation of volume of concrete, the volume of concrete shall include the volume of sand and bitumen in sand cored foundation. However, for the purpose of computation, of quantity of cement utilized in sand core foundations, the volume of the sand bitumen used in core hole should be deducted from the total volume of the foundation.
- X. For purposes of computation of volume of concrete the volume of each muff for all masts shall be taken as 0.02 Cu.m. except for masts with balance weights and for each column of portal, each head span mast, 2 or 3 track cantilever masts, and special fabricated masts for which the volume of muff shall be taken as 0.08 Cu.m. Irrespective of the size and shape of muff, on a flat basis.
- XI. The pieces prices under item 6 shall also include the cost of concrete cable trenches and trench covers at the switching stations as well as embedment of drain pipes, where required.
- XII. The prices shall also cover the cost of diversion of masonry/earth drain wherever necessary for casting of foundations.

5. Supply of steel structure galvanized including Traction masts, AT masts, fabricated steel other than mast, SPS etc. for AT mounting:-

This shall cover the cost of fabrication, galvanization & supply of different type of galvanized traction masts/main masts, galvanized steel structures for AT mounting mast (AT Mast T150) including SPS and small parts of steel nuts, bolts & washers etc including small steel parts etc. as per assessed requirement or instructions of Engineer at

purchaser (as per Drg. No. ETI/ PSI/037, Mod 'B"). AT mast shall be Hot dip galvanized as per RDSO specification No. ETI/OHE/73(4/25) or latest & mounting arrangement as per RDSO drawing No. ETI/PSI/036 or latest.

For the purpose of payment, the weights of individual traction masts shall be determined on the basis of the payable weights per meter length and per meter weights given in Railway's approved drawing. The price shall cover cost of supply at respective site/locations, as per RDSO drawing of individual traction mast, dwarf masts, and main masts. For the purpose of payment, the weights of individual traction masts and masts of headspan shall be determined for each type on the basis of the payable weights per meter length and per meter weights given in tables of Rlys.(as per respective RDSO drawings for standard types). For special types, the payable weight per meter length will be decided by the Purchaser at the time of approval of designs. Manual erection of traction masts. (Masts and dwarf masts):- The price shall cover cost of manual erection, alignment and setting before grouting of individual traction mast whether rolled or fabricated.

Note:-

1 For the purpose of payment, the weights of individual traction mast shall be determined for each type on the basis of the payable weights per meter length as given in the Railway's approved drawing. For special types, the payable weight per meter length will be indicated by the Purchaser at the time of approval of designs.

2. The price 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 uprights bent during transit and cutting of masts / portal uprights to suit the site conditions.

6. Manual erection of steel structure galvanized including Traction masts, AT masts, fabricated steel other than mast, SPS etc. for AT: -

This shall cover cost of erection, alignment and setting before grouting of individual OHEmast. Item also covers stenciling of location number and other parameters on masts / portal uprights in the manner as directed by the Purchaser. The item shall also include the straightening of masts / portal uprights bent during transit and cutting of masts / portal uprights to suit the site conditions.

- The item shall erection, alignment and setting as per site requirement by manual/road cranes for which contractor will bear the all expenditures. SPS, DA, Chair, Bkt. will be erected in power block whenever block is granted for which contractor should ready for erection of cantilever assemble by arranging all required resources (i.e materials, skilled manpower, T&P items, road cranes, lighting & generator arrangement even in night working if block grants during night, Rly. will not make any extra payment for the same. price covers erection of galvanized bolts, nuts, washers, fittings, super mast etc. wherever required for the erection of above items as per approved designs and drawings.

7. Supply, Erection, & commissioning of single phase 25 kV DO fuse unit complete with Pedestal insulator assembly as per RDSO's specification no. ETI/PSI/14 (01/86)Rev. I (Apr. 87) and Drg. No. ETI/PSI/032 or latest:

The price of erection shall cover supply of all components required for erection. This shall cover supply and erection of 25 kV DO fuse switch assembly complete with all mounting accessories and terminal connectors, insulators as required as per RDSO specification No. ETI /PSI /14 (1/86) or latest version. The fuse switch shall be erected on steel channel away from structure as per Drg. No. ETI / PSI /032 with latest modifications. It shall also include the supply and erection of fuse element and link of requisite capacity suitable for 25 rated capacity in kVA, 25 kV/240 Volts LT supply transformer.

8. Supply & Erection of Anti climbing arrangement (device) as per Drg. No. ETI/PSI/037:

The price shall cover supply, erection, & commissioning of all components required for erection of Anti climbing arrangement (device) as per Drg. No. ETI/PSI/037. The price of

erection shall cover supply of all components required for erection. It also includes fixing the same on AT mast including all fasteners.

9. Supply & erection of LV Box assembly with 63 AMP MCB (D/pole) and 63 AMP porcelain cut out as per Drg. No. ETI/PSI/0310:

The price shall cover supply & Erection of all components required for erection of LV Box assembly as per relevant drawing and specification. The price of erection shall cover supply of all components required for erection with neutral link. It also includes fixing the same on AT mast including all fasteners.

10. Supply & erection of LV Box assembly with 150 AMP MCB (D/pole) and 150 AMP porcelain cut out as per Drg. No. ETI/PSI/0310:

The price shall cover supply & Erection of all components required for erection of LV Box assembly as per relevant drawing and specification. The price of erection shall cover supply of all components required for erection with neutral link.

11. Supply & Erection of Structure Bond (from AT to earth pit, duplicate earthing, and mast to rail & earth pit to rail):

The price shall cover supply of all materials including M.S. flats required to provide structure bond connecting a traction mast or structures to the nearest non-track circuited rail, or earth electrode, including all fastenings at both ends as per RDSO/CORE drawing. The price shall include shaping and drilling of the bond and erection of all materials including the bond. The price shall also include provision of heat shrinkable PVC tube for structure bond under track circuited rail. This would also cover connection or earthing terminals of equipment like L.T. transformers with structures and then to rails if any as per relevant drawing. The X-area of M S bond shall not be less than 240 sq mm.

12. Supply and erection of caution board and danger board:

The price shall cover the cost of supply and erection of caution board and danger board as per relevant RDSO specification/drawings with latest amendments and erection of the same on structures as per requirement of consignee 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.

13. Provision of Retro Reflective number plate:-

This shall cover the cost of supply of Retro Reflective number plates/boards as per relevant RDSO specification/drawings with latest amendments, and

erection of the same onstructures as per requirement of railway engineer using proper clamps, nut bolts etc. required for erection at specified locations which are not covered in any other item.

14. Supply and erection of earth electrode, earth pit, earth pit cover as per drawing no. ETI/OHE/P/7020- conventional earthing including charcoal & salt etc. in all typeof soil including rocky:

Supply & erection of earth electrode, digging of earth pit, fitment of earth electrode havinglength of 3 mtrs. along with nut, Bolt, spring & washers etc. as per RDSO specification &drawing. The price shall cover supply of earth electrode length of 3 mtrs. It also includes supply and filling of alternate layer of charcoal/coke and salt as shown in the drawing. It also includes erection of earth Electrode as per drawing no. ETI/OHE/P/7020 with its latestversion. The earth electrode will be connected with the existing MS flat. The price shall include the testing of earth value which should be less than 8.0 ohm and painted on the earth box Contractor has to arrange earth treatment of the soil to achieve earth resistance ofless than 8.0 ohm if required. The work will be carried out either by boring method or by digging of pit but the diameter of the pit should not be less than 200 mm. and 3100 mm depth. The earth electrode already included in any other item will not be covered under this item.

15. Supply, fixing, testing and commissioning of automatic change over control and distribution panels (CLS Panel) as per latest RDSO spec. No. TI/ SPC/ PSI/ CLS/ 0020 with A&C slip no. 1 to 4. CORE approved Drg no. ASCOS/ CORE/ 2005/ 01 Rev.02 or latest for 63Amp capacity, 240V,5 0Hz for 10kVA AT & 150 Amps capacity, 25kV/240V,50Hz for 25kVA AT.

The work includes supply, fixing and commissioning of automatic colour light Signallingpanel/ automatic colour light change over as per RDSO specification No. TI/SPC/PSI/CLS/0020 with latest A & C slip 1 to 4.

- a) The CLS control panel shall be procured from the valid RDSO/CORE approved manufacturers only.
- b) CLS control panel shall be provided at the locations as approved by nominated Railway engineer.
- c) The power arrangement to the CLS control panel shall be as per the relevant schematic diagrams approved as per Railway Board's L. No. 82/RE/250/1 dated 13-09-2002 or latest.
- d) Auxiliary transformers (ATs), local supply and supply from inverter or supply from DG set, as the case may be, will be terminated on the automatic change overpanel.
- e) Proper fixing arrangement on the wall/on a suitable MS angle frame as per the sitelocation and directed by nominated Railway supervisor / representative shall be made. All material required for fixing shall be supplied by contractor.
- f) The supply, erection, testing and commissioning of the CLS control panel shall beas per the RDSO's specification.
- g) The glands, ferrule, lugs, cable number indicator etc shall be supplied by contractor.

- h) The contractor shall arrange skilled manpower, testing equipment's and tools to test and Commission CLS panel. If any part is found defective during testing /Commissioning, same shall be replaced by the contractor free of cost.
- i) If any defect is noticed during maintenance period, same shall be attended with replacement of item, if required by contractor without any claim for additional cost.
Note: Transportation of material up to work site with loading/unloading and shifting shall be done by contractor.
- j) Provision of Separate Earthing for CLS panel will be done by contractor. Earthing of the panel and equipment shall be as per IS: 3043 (latest edition).
- k) Covering of CLS panel by wooden box or Gypsum/ACP board etc. as instructed by railway engineer.

16. Supply and fixing of medium class GI pipe of size 50 mm dia duly clamped.

- a) The item includes supply and fixing of medium class GI pipe of size 50 mm dia duly clamped.
- b) The GI pipe of 50 mm. dia. is to be provided for size of cable i.e. 2x150 sq mm, 2x70 sq mm and 2x25 sq mm.
- c) The GI pipe shall be of B-class.
- d) The GI pipe shall be fixed with AT mast/Rail pole/wall in vertical position at a length of about 200 cm. above ground level.
- e) One end of the GI pipe should be grouted in the ground/muffing and the other end should be provided with suitable thimble/PVC bushing in ICDP switches, one each at AT end & other end at CLS control panel end.
- f) Each OHE mast/Rail pole/wall and the pipe shall be provided with casting/recasting of concrete muff around each pole of 300 mm. dia. and 300 mm. height from ground level. The muffing shall be suitably white washed.
- g) The GI pipe shall be clamped properly with MS flat clamp of size 40x6 mm & wooden cleat, to secure it. The gap between GI pipe and cable shall be sealed properly so that rain water does not go into the pipe. Wooden or PVC grommets shall also be used at each end of GI pipe to eliminate the risk of cable damage. Transportation of material up to work site with loading/unloading and shifting shall be done by contractor.

17. Supply & fixing of J' type cable route marker made of cast iron as per approved Railway drawing.

- a) The item includes supply and fixing of 'J' type cable route marker made of cast iron as per approved Railway drawing by fixing /grouting along with laying of cables in trenches of all class of soils.
- b) The cable route marker shall be provided at every 50 mtr distance approximately and also a bending /turning point of the cable route. The cable route marker will be J' shape made of MS angle size 25x25x3mm, one meter long with RM plate and shall be available at the site at the time of laying of cable.

- c) The cable route marker shall be of approved design by Railway authority before arranging procurement by the contractor. The letters "AT cable" mentioning UP /DN AT should be engraved on the cable route marker.
- d) Transportation of material up to work site with loading/unloading and shifting shall be done by contractor

18. Supply and erection of Hume pipe 150 mm dia with RCC color:

The price shall cover for cost of supply of Hume pipe for laying of cable under Railway track/Road in Hume pipe of not less than 150mm inner dia. The depth of the pipe shall be 1 Mtr. from bottom of sleeper to the top of the pipe. The cable shall be protected at the exit and entry points through suitable grommets. The Cost of supply of Hume pipe covers under this item.

19. Supply and erection of a solid core cut-in-insulator/Suspension insulator/9T feeder insulator with arcing horn arrangement for AT.

This is applicable to the provision of an additional 9T 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. This 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. This shall cover erection of all components, including the 9 Tonne insulator [after testing as per RDSO procedure before erection]. The all-other similar insulator not covered in any other item will be paid in this item inclusive of appropriate terminal fittings etc.

20. Supply and erection of copper strip for LV terminal earthing size 25 mm x 3 mm:

The price shall cover for Supply, erection & commissioning of copper strip for LV terminal earthing (size 25 x 3 mm).

21. Supply and Erection of Copper jumper with clamping arrangement:

The price shall cover erection & commissioning of all components required for erection of copper jumper size 50 sq. mm & 7 sq. mm copper wire from DO fuse to transformer with clamping arrangement. This shall cover, on a flat rate basis, the supply of jumper wire, all components and fittings required for providing a flexible copper jumper connection, including parallel clamps, bimetallic and aluminum copper ALUC strips, wherever required, and terminal or the clamps at either end, including jumper wire. This shall also cover the erection of the complete jumper assembly including jumper wire. This shall not however, be applicable for jumper connections already included under other items, but shall be applicable for any jumper connections in any combination between feeders, LT transformers, drop out switch, lightning arrestors for over head equipment, isolators and overhead equipment etc. and outgoing bus bars for switching stations and booster stations. Continuity jumper at Boom anchor anti creep will be payable under this item. The supply of all components and fittings including the catenary wire for providing double catenary contact wire in place of catenary under

over line structures as per Drg. No. ETI/OHE/SK/446 and ETI/OHE/SK-529 respectively will also be payable under this item, treating the double catenary as one jumper irrespective of the length. The item shall cover erection & commissioning of all components required for erection of copper jumper size 50 sq. mm & 7 sq. mm copper wire from DO fuse to transformer with clamping arrangement.

22. Supply, connecting, commissioning of cable termination along with lugs, clamps fixtures, glands etc. for 1100 V grade cable (Each set contains piece for both the ends of cable) 2 core 70 sq.mm and 2 core 150 sq.mm:

The price shall also cover supply of Cable Termination of 2 x 70 sq.mm cable and 2x150 sq.mm cable. The terminals of the cable shall be provided with suitable cable lugs and glands as per requirement. Near the cable termination point, armour of the cable shall be thus connected with panel body for proper earthing. Correct size thimbles of approved makes shall be used and crimped. Proper gland should be used for cable holding at entry and exit of cable. Testing and commissioning of different size of cable is included in this item.

23. Supply of 2Cx70 & 2Cx150 sq mm PVC insulated and sheathed aluminum armored XLPE cable as per RDSO specification & latest IS.

This shall cover the cost of supply of **2Cx70 & 2Cx150** sqmm aluminum conductor PVC insulated Armoured, unscreened, underground railway power cable (Including spare cables for each AT) as per RDSO specification & latest IS.

24. Supply of contact wire PG clamp assembly RI no.-1040-2 as per latest RDSO specification no. ETI/OHE/P/1040-2 Rev. E:

The price shall cover Supply of contact wire PG clamp assembly RI no.-1040-2 as per latest RDSO specification no. ETI/OHE/P/1040-2 Rev. E Item. The price shall cover supply of suspension clamp complete with all accessories and fasteners as per RDSO Drg.No.-RE/33/P/1160 or latest.

25. Normal cable laying in earth:

The price shall cover excavation and supply of all required material for cable trench (separate trench for each cable) of required size and laying testing & commissioning of LT cable of size 2 x 70 sq. mm or 2x150 sq.mm. One no. spare cable also to be laid for each AT. The cable shall generally be laid in accordance to I.S. 1255 1983 or latest (code of practice for installation and maintenance of power cable up to and including 33 kV rating). Cable shall be laid in 310 mm wide and uniformly dug trench at a depth of 1 Mtr. as indicated in relevant drawing. The depth of sand below and above the cable shall be 80 mm respectively. The cable after laying and after covering by sand shall be protected by one layer of brick size 19 cm x 9 cm x 9 cm of grading class 2 as per IS-2212-91 transversely. After placing the bricks, the screened earth should be refilled properly up to the ground surface and properly leveled.

26. Under track cable laying:

The price shall cover for laying of cable including cost of supply & erection of Hume pipe under Railway track/Road in Hume pipe of not less than 150mm inner dia. The depth of the pipe shall be 1 Mtr. from bottom of sleeper to the top of the pipe. The cable shall be protected at the exit and entry points through suitable grommets. The Cost of supply & erection of Hume pipe covers under this item.

Note 1 : Tentative cable route plan will be given by the concerned depot in charge for taking up the work of cable laying. However, contractor shall supply 4 sets of as erected drawings for cable laying and route plan.

Note 2 : Should be laying of the cable involves road crossing under the ground, the permission from the state Govt./other relevant authorities, the same shall be arranged by the contractor at his own cost and efforts. Delay on this account will be treated on contractor's account.

Note 3: Cable shall be laid in single piece without having any joints. Loop of at least 2 mtrs. at both the ends shall be provided to facilitate maintenance in future.

Note 4: All fitting or accessories which is not specifically mentioned in the specification but is essential for proper functioning of the system shall be provided by the contractor without any extra charge.

27. Laying cable in air/wall/pole along with fixture.

The contractor shall have to lay cable open in **air/wall/pole** as per decided by the site Engineer (i.e. wall/Ceiling). Cable should be properly terminated with standard size of lug. The cable along the wall should be provided with suitable size of Cable tray, M.S. clamps, Reg Bolts / J bolts shall be provided for supporting the cable. The distance between two supports 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.

28. Laying, testing & commissioning of HT/LT XLPE cable in the existing trench, DWC pipe, GI pipe.

This item covers laying of LT 1100 volt 2 core cable size upto size 300 sqmm, armoured cable in the existing trench, HDPE pipe, GI pipe etc. as per the quantities mentioned in the schedule. Spare AT cable along with main cable is to be laid for each AT.

i) Before laying the cable the trench/pipe should be thoroughly checked for sharp ballast, stone etc. so that the insulation of the cable may not be damaged. Two lengths of the cable shall be laid for each crossing. Out of the two cables one will be connected to overhead line and other shall be kept as stand by. All the cables shall be suitably and separately clamped on the DP structure/Pole with MS flat clamps, nuts, bolts etc.

ii) Before and after laying of the cable, the IR value should be checked and all the instruments for testing shall be arranged by the contractor.

iii) While laying the cable care should be taken that no tree roots come on way of the cable, as it may damage the insulation.

iv) Armoring of the cable should be earthed at ends.

v) Cable crossing on the Road/Rly. Track should be at right angle. The pipe shall be laid in a slope for easy drain out of the water and joints between the pipe should be water proof.

29. 42kV kV, 10 kA Metal Oxide Gapless Type Lightning Arrestor with Insulating Base and Surge Monitor 40 sqmm copper cable as Per RDSO Specification No. TI/SPC/PSI/MOGTLA/0101 (02/2015) or latest.

The price shall cover the supply of 42 kV, 10 kA Metal Oxide Gapless Type Lightning Arrestor with Insulating Base, Surge Monitor along with 40 sqmm copper cable for surge monitor as Per RDSO Specification No. TI/SPC/PSI/MOGTLA/0101 (02/2015) or latest.

30. Erection of 42 KV LA. With surge monitor and disconnecter assembly.

The price shall cover the erection of 42 kV LA with surge monitor with cable termination etc. and disconnecter assembly, as per railway requirements.

31. Disconnecter assembly suitable for lightening arrestor of 25kV side of traction system as per RDSO spec no. TI/ SPC/ PSI/ MOGTLA/ 0101(02/2015) or latest.

The price shall cover supply of Disconnecter assembly suitable for lightening arrestor of 25kV side of traction system as per RDSO spec no. TI/SPC/PSI/MOGTLA/0101(02/2015) or latest.

32. Supply of Annealed Stranded Copper Jumper wire (50 Sqmm) (19/1.80 mm) as per RDSO Spec. No. ETI/OHE/3(2/94) with A and C Slip No.1

The price shall cover the supply of Annealed Stranded Copper Jumper wire (50 Sqmm) (19/1.80mm) as per RDSO Specn. No. ETI/OHE/3(2/94) with A and C Slip No.1 or latest.

33. Supply & laying of HDPE pipe of 75-450 mm dia or suitable size as per requirement, wall thickness 3mm.

The work involves laying of HDPE pipe as per specification. 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 **75-450 mm dia** or suitable size as per requirement and wall thickness shall be **3mm**. It involves laying of cable in 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. Make & relevant IS as reference list attached.

34: Excavation of trench in all kinds of soil & making ditch in rocky area for 500 mm wide 1000 mm deep.

This item covers excavation of trenches in all types of soil and having width of trench of 50 cm for laying cable. The depth of trench is increase 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 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 HDPE/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.

35. Drilling of horizontal bore below track by pushing method by suitable means for laying of HDPE/GI/RCC pipe of various sizes.

The 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/GI/RCC pipe from 75mm to 450 mm as required 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 representative without disturbing the Railway track taking all necessary safety precautions related track and movements of trains. Since the bore is to be made at different locations as per crossings tracks, all the transportation, loading & unloading of equipments 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.

36: Excavation of Cable trench by cutting/breaking of platform concrete pucca floor 300 mm deep & 300mm. wide and refilling the cut portion with normal soil and refinishing the said portion of platform with 1:2:4 cement concrete mixture 150 mm deep and 300 mm. width after laying of cable and clear the platform. Restoring to its original position. All material shall be supplied by the contractor.

The work involves excavation of cable trench by cutting /breaking of station platform concrete pucca floor 300mm deep and 300 mm wide and refilling cut portion with the normal soil and finishing the said portion of platform with 1:2:4 cement concrete mixture 150mm deep and 300mm wide after laying of cable in the pipe. The contractor shall repair the damaged surface, floor, path way, channels, platform or any other structure to its normal position after laying the cable. All the material including concreting material shall be supplied by the contractor.

37: Supply, installation, testing and commissioning of 63A/150A 2P-"C" type MCB or as required as per RDSO specification.

- a) The work involves supply, fixing and commissioning of rain proof sheet steel enclosure distribution box, dust and weather proof with front opening, outdoor type, with 63A/150A MCB with back up fuse.
- b) The distribution box shall be of reputed make as approved by RDSO specification. If any brand (s) is approved by WCR, same shall be procured.
- c) The box should be fixed at location as per direction of Railway Engineer.
- d) Required clamps, bolts, nuts etc for fixing of board shall be supplied by contractor and cost of these items is included into it.
- e) MCB- 2 Pole, 63/150 amps Breaking capacity-25 kV, C series as in comer similar to cat no. SH201M-C 63/150 of ABB make or similar.
- f) MCB- 2 Pole, 63/150 amps Breaking capacity-10 kV, C series as in comer similar to cat no. SH201M-C 63/150 of ABB make or similar.

38: Supply of DWC HPDE pipe of 120- 450 mm dia along with all required material for joining the pipes.

The items covers supply of 120-450 mm ID, Double walled Corrugated (DWC) HPDE pipe of reputed manufacturer confirming to Railway specification. The contractor shall have to submit manufacture test certificate and should be as per latest Railway specification with anti-rodent, antioxidant and non-flammable properties. It also includes the supply of all required material for joining the pipes.

39: Laying of DWC HPDE pipe of 120-450 mm dia in the trench.

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.

Note:

Material Reconciliation shall be done by Contractor as directed by Railway representative and suitable stacking and submission of removed equipment/item shall be done as per directions of Railway Representative. No additional payment shall be done to the contractor for this item.

40: Supply and erection of structure bond: -

This 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 as per RDSO/CORE drawing. This 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 coat of bitumen paint. This shall also include provision of heat shrinkable PVC tube for structure bond under track circuited rail. This would also cover connections or earthing terminals of equipments like L.T. transformers with

structures and then to Rails as per relevant drawing. The X-area of M S bond shell not be less than 240 sq mm.

41: Supply and erection of caution board, unwired board, engine stop board, Sigma board etc. and other similar board: -

This 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.

42: - Supply of steel structure galvanized including Traction masts, main masts, fabricated steel other than mast, SPS etc. for OHE: -

This shall cover the cost of fabrication, galvanization & supply of different type of galvanized traction masts/main masts, including small steel parts etc. as per assessed requirement or instructions of Engineer at purchaser.

43: Manual erection of steel structure galvanized including Traction masts, main masts, fabricated steel other than mast, SPS etc. for OHE: -

This shall cover cost of erection, alignment and setting before grouting of individual OHE mast.

44. Supply and erection of Guy rod assembly: -

This shall cover supply and erection of guy rod assembly (including anchor loop for anchor block) of various lengths for traction masts, feeder line towers or portals or other supports complete with modified/latest mast guy rod fittings, guy rod with adjustments etc. as per RDSO specifications and parts to be grouted in the anchor block.

45. Supply and erection of all aluminum 25 KV feeder wire: -

This shall cover supply and erection of 25 KV feeder conductors (along or across tracks) made of single all aluminum bare, hard drawn conductors (19/3.99 mm, cross section- 234sqmm) as per relevant RDSO and small parts steel works, complete with bolts, nuts etc, if any.

Supply and erection of material for termination of single overhead equipment conductor or a terminating wire: -

This shall cover supply & erection of all material necessary for the termination of single conductor of overhead equipment or feeder wire or terminating wire on a traction mast or structure, including appropriate mast anchor fittings, clevis assembly, adjuster, anchor double straps, ending clamp for the catenary or contact wire or terminating wire and fittings including 9 Tonne insulator assembly. This shall cover erection of all materials including the 9 Tonne insulator [after testing as per RDSO procedure before erection] assembly and terminating wire, if any.

46: Supply and erection of solid core cut-in-insulator/Suspension insulator/9T feeder insulator for OHE modification: -

This 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. This 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. This shall cover erection of all components, including the 9 Tonne insulator [after testing as per RDSO procedure before erection]. This shall also be applicable as an adjustment price for non-provision of insulators under items 8(b)(i) to 8(b)(ii). The all other similar insulator not covered in any other item will be paid in this item inclusive of appropriate terminal fittings etc

47:- Supply, Shifting/Erection of complete PTFE short neutral section assembly(phase break) as per relevant latest RDSO specification:-

This shall cover shifting/erection and adjustment of complete PTFE short neutral section assembly with all components and accessories required for formation of neutral section as per relevant latest RDSO specification. All the necessary tools & plants required for the erection work will be supplied by the contractor at his own cost. All OHE modification work required for shifting of short neutral section infringing with signals will be as per standard guideline of ACTM & will be done by Contractor.

48: Supply and erection of copper jumper: -

This shall cover, on a flat rate basis, the supply of jumper wire, all components and fittings required for providing a flexible copper jumper connection, including parallel clamps, bimetallic and aluminum copper ALUC strips, wherever required, and terminal or the clamps at either end, including jumper wire.

This shall also cover the erection of the complete jumper assembly including jumper wire. Continuity jumper at Boom anchor anti creep will be payable under this item. Anti-theft jumper (a set of three jumpers) as per drawing No. ETI/OHE/G/05107 for connecting out-of-turn OHE with the in running OHE at insulated/ Un-insulated over-lap locations and also considered necessary will be payable under this item. The supply of all components and fittings including the catenary wire for providing double catenary contact wire in place of catenary under over line structures as per Drg. No. ETI/OHE/SK/446 and ETI/OHE/SK-529 respectively will also be payable under this item, treating the double catenary as one jumper irrespective of the length.

49: Provision of Splicing and extension of OHE: -

This shall cover splicing of termination of overhead equipment for extension and consequent adjustment of the effected equipment. The dismantled equipment (excluding portion embedded in concrete) shall be returned to the purchaser's Engineer. The cost of dismantling of overhead equipment would

be paid for item no. 12 for the whole length of the anchoring span irrespective of the physical position of the splices. The extended overhead equipment shall be deemed as starting from the center line of the structure preceding the old terminating structure.

50. Shifting of IOL of OHE:- As per ACTM minimum distance between centre line of IOL of OHE & Stop signal should be 120 m. If there is infringement of IOL of OHE with signal, then all OHE modification work involve with shifting of IOL will be done by contractor. The shifting will involve cement concrete foundation, supply and erection of galvanized mast & SPS, supply and erection of cantilever assembly, supply and erection of OHE with complete fittings, supply & erection of contact & catenary wire as required, supply & erection of guy rod assembly, supply and erection of ATD & dismantling of existing TRD assets etc.

ELECTRICAL(G)

Electrification of the all-new service buildings (station buildings/ LC gate/IBH/ABS Huts.

SPECIFICATION FOR EARTHING

1. A 300 mm x 300 mm x 300 mm (inside dimension) concrete box (wall thickness min. 50mm) with smooth cement plaster finish shall be provided on the top of pit. A concrete lid of 50 mm thick, with pulling hooks, painted black shall be provided to cover the earth pit. PVC sleeve of appropriate size shall be provided in concrete wall to take out earthing connections.
2. The masonry work shall be white washed inside and outside.
3. Care shall be taken regarding 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 backside of the cover, date of test and average resistance value shall also be written with yellow 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 respect like connection, inter-connection etc.
6. Two separate and distant earth connection shall be provided for all metal parts, structures and equipments.
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. The earth connection strips of the main earth buried under ground shall be covered with dry sand 50mm around.
10. Pipe electrode shall be provided and their dimension shall confirm to drawings as per the relevant IS.
11. No. of earth electrode shall be so decided that combined earth resistance of earth bus shall not exceed more than 2 ohms for plate electrodes.

- 12 The distance between 2 earth electrodes shall not be less than twice the length of electrodes.
- 13 The size of the earthing conductor from earthing pit to the other end shall be of 6 SWG GI wire.
- 14 Pipe electrode 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 as per relevant IS/ specifications

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.

Cable laying in trench:

This involves Excavation of 1000 mm deep trench in soil/hard murrum/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 bottom of the trench. After this the cable shall be laid and then both sides are to be covered with 'B' grade bricks, thereaftersand to be filled on the cable by 75 mm thick layer followed with final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

Cable laying in trench in rock:

This involves Excavation of 750 mm 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 sandat 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 75mm thick layerfollowed with final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

Cable laying in loop form in each end:

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

Supply of 150mm dia. RCC pipe with collar and laying after excavation of 1000 mm deep trench.

Cable laying inside 150mm dia. RCC pipe on road/track crossing and reforming original surface ofthe road/track.

This involves laying of cable in the RCC pipe already laid. Then filling of trench by sheaved earth. Then reforming of surface of this trench to match with the original surrounding surface.

Erection involves the Cable laying on wall/pole, fixing using MS flat [25x6mm.] clamps, nuts, bolts,screws or nails as per site requirement etc.

Supply of pipe, as per schedule, ISI marked pipe for cable support on wall/pole/road.

Erection involves fixing of 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.)

Supply portion under this item shall mean that cost of glands (brass cable glands), termination. Erection involves connecting, commissioning of cable with nuts, bolts, on both end of cables & supply of these materials nuts, bolts etc.)

Cable route marker: Supply & providing cable route markers marked with 'L.T. / H.T. cable' as required at every turning points/road crossings and at 20 Mtr. distance. Erection involves foundation of cement concrete with 1:3:6

FOR WIRING :

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

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. 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

3) 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 fibre 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 sqmm
- b) From SDB to switch board for light /fan/ 5A plug :2.5 sqmm
- c) From SDB to separate 5A switch board :2.5 sqmm
- d) From SDB to separate 15A socket point wiring : 4.0 sqmm
- e) From SDB to 20A metal clad socket separate circuit (AC) : 4.0 sqmm
- f) For Sub-mains (Meter to SDB) : 6.0 sq.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. 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 plugtop 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 (ISI/BIS Mark). 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) 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 live conductor. The earthed neutral conductors shall be connected to a common link and be capable of being disconnected individually for testing purpose. 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 situation.

(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 exhaust fan point. Wiring of exhaust fan point 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 rule.

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

(XVI) The control board shall be of wood with sun-mica top.

(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 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 same as for surface conduit system and shall be mounted flush with the wall/ceiling.

WIRING IN P.V.C. CONDUITS: The P.V.C. conduits shall be of approved make and brand, (I.S.I./BIS) marked of heavy 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 requirement 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.

LAYING OF CONDUIT IN SLAB : conduit pipe shall be laid in slab or beam along with reinforcement before concreting .The conduit pipe shall be laid over the bottom reinforcement the slab of beam unless required otherwise, such that the open face of the outlet box in flush with the surface of the slab or beam .The conduit pipe shall be fastened securely to the nearest reinforcement with 16 gauge steel wire .The outlet box shall be at least 63 mm to 73 mm deep, check nut should be provided to prevent entry of cement concrete in conduit pipe during the concreting .The outlet box shall be filled with clay or hessian cloth so that the concrete does not fill in it. All bends shall be made by bending the conduit pipe. To facilitate drawing of wire in the conduit, 16 SWG fish steel wire shall be provided in the conduit during its erection.

The out let boxes shall be same as for surface conduit system and shall be mounted flush with the ceiling.

12.0 METERING

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

13.0 INDICATING LAMPS:

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

14.0 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.

15.0 MCBs:

‘L’ series MCBs or equivalent shall be used only for normal lighting circuits.

‘G’ series MCBs or equivalent shall invariably be used for meter loads and all power circuits.

FOR CEILING FAN:

Governing Specification IS	: 374 or latest
Size / Type / Performance	: As per IS 374 latest
Fan Size	: 1400
Type of Fan / Type of the Motor	: DC / Brushless DC (BLDC)
Minimum Air delivery and service value:	As per clause 8.1 of IS: 374 latest
BEE Star Rating	: 5 Star
Air delivery at test voltage (m ³ /min)	270
Power consumption (Maximum)	35
Power factor	: 0.99

Rated speed (rev/min)	290
Number of blades	3
Type of bearing	: Double Ball Bearing
Blade Material	: Aluminum
Accessories in the scope of supply	: Nut, Bolt, Clamp,
Remote Warranty (in year)	: Minimum 1

FOR SUPPLY OF 380 MM SWEEP EXHAUST FAN:

Supply of 380 mm sweep all Metal body construction industrial type heavy duty exhaust fan, propeller type, single phase, 1400 RPM complete with all standard accessories with minimum warranty of one year or more as per the manufacturer as per approved list. The erection of the exhaust fans are to be done by making proper opening in the wall appropriate to the size of the exhaust fan and its fixing arrangement by using required fasteners, their grouting and then connection is to be given from ceiling rose to this fan using cable of requisite size. It also includes the plastering of the surrounding wall and wall finish shall be maintained to the surrounding one.

(A) Special Conditions of contract for Electrical Part :

1. The Electrical part of schedule shall be read in conjunction with the explanatory notes and Technical specification.
2. The Electrical Supervisor for the works shall be nominated by Sr.DEE(G)JBP. The measurement of electrical work will be done by the nominated Electrical supervisor only.
3. The Electrical work shall be carried out under the Supervision of the Electrical department. Necessary measurement of Electrical works executed shall be Electrical Supervisor and test checked done by officer nominated by Sr.DEE (G) JBP.
4. No Electrical fitting/wires/cables/machine/equipment will be allowed to be fixed till it is approved by authorized engineer (of/or) Sr. Divisional Electrical Engineer (General), Jabalpur.
5. LED luminaries have five year warranty/guaranty delay in replacement on defective beyond 10 days Penalty of Rs 5 per day per fitting will be charge as deduction from SD
6. Electrical Licence Condition: As per CEE/JBP's office letter no WCR/L/10/Tender policy/61394 dtd: 23.07.2015 which stated that "The contractor will ensure to carry out electrical work either by himself if he has a valid electrical license or through any sub- contractor who has a valid electrical license. The contractor will submit a certified copy of electrical license or will submit an affidavit at the tender stage that he will deploy electrical sub- contractor with the valid electrical license. The above will

be submitted before execution of electrical work.”

7. The tenderer shall visit the site before filling of tender forms, so as to have a clear idea of location, infringements and other topography of location in respect of quantum of work involved and then only he shall quote. It shall be presumed that participants in this tender have seen the site before quoting their offer
8. The identity card should be issued to the contract labourers nominated to work in the railway premises by the contractor, indicating Contract No, Name of the person, place of work etc. If identity card is not issued to contract labourers, labours will not be permitted to work in the Railway premises. The list of the labour should be submitted to this office for records.
9. If not specified elsewhere in this tender booklet, then manufacturer's test certificate, proof of manufacture by approved manufacturer /brand, proof of placement of order by the contractor on approved manufacturer, and certificate of conformity of product to relevant IS specification of manufacturer shall be supplied by the contractor in original for the items if considered necessary by the Engineer for EIG sanction.
10. The site plan for all the stations will be made available to the successful tenderer at the time of execution of the work.
11. After visiting the site before quoting in tender any other material; if considered necessary; by the contractor for successful completion of work, which is not included in the tender schedule, may be quoted separately with full details and justification for

consideration of the purchaser. Later, on award of work to successful tenderer, no dispute shall be entertained by Railway, if nothing is quoted as per this point.

12. Successful tenderer shall ensure supply of all items as per relevant IS, if Railway Specification is not provided and shall show/ bring his own IS as and when demanded by Railway representative. If Railway specification contains reference to IS specifications, then also, above shall apply.

13. GUARANTEE:

- (a) The contractor shall guarantee satisfactory working of the installations erected by him for a period of 12 (Twelve) months except LED items from the date of commissioning. **For LED fittings etc., the guarantee period will be 5 years from the date of commissioning. Till then the complete SD (Security Deposit) pertaining to Electrical (G) portion of the work will be kept with Railways.**
- (b) During the period of guarantee, the contractor shall be liable for the replacement at site of any parts which may be found defective, whether

arising from faulty design, materials, workmanship or negligence in any manner on the part of the contractor provided always that such defective parts as are not repairable at site are promptly returned to the contractor if so required by him at his (contractor's) own expenses. The lamp, chokes/ballast are to be maintained by the contractor for one year within guarantee period.

(c) The repaired or renewed parts shall be delivered and erected on site free of charge to the purchaser. During the period of guarantee the contractor shall keep available an experienced engineer and necessary equipment to attend to any defects.

14. Inspection:

All the erection and installation work shall be subject to inspection by the purchaser time to time during execution to ensure that the work is done in accordance with technical data, drawings and is of the best quality suitable for the purpose. All the defects / discrepancies, if any, pointed out during inspection should be attended by the contractor immediately.

1. As soon as the erection of the installations in each location is ready for inspection, testing & commissioning, the contractor shall advise to Sr.DEE(G),JBP. or his representative.
2. After completion, the following tests shall be carried out before putting the installation into service.
3. Insulation resistance, Earth continuity and its resistance & various other if required for EIG. On completion, a certificate in a prescribed form shall be furnished by the contractor with countersignature by the "licensed supervisor" of the contractor.

Civil work Requirements:

1. Boring, providing and installing cast-in-situ single under reamed piles with bulb dia of 2.5 times the pile dia of any length in M 35 grade to carry a safe working load not less than specified including cost of boring with bentonite solution.
2. Providing and laying in position M 20 Grade concrete for reinforced concrete structural elements but excluding cost of centering, shuttering, reinforcement and Admixtures in recommended proportion (as per IS:9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer in charge.
3. Foundations, footings, bases of columns, raft foundation of washable aprons, Pile caps, Footings of FOB etc.
4. Supplying Reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete.
5. Earth work in excavation as per approved drawings and dumping at embankment site or spoil heap, within railway land, including 50m lead and 1.5m lift, the lead to be measured from the Centre of gravity of excavation to Centre of gravity of spoil heap; the lift to be measured from natural ground level and paid for in layers of 1.5m each including incidental work, as per specifications.

6. Providing and applying plaster of Paris putty of 2mm average thickness over plastered surface to prepare the surface even and smooth complete.
7. 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.
8. 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 0.63mm.
9. 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.
10. 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/10sqm.
11. Providing and laying APP (Atactic Polypropylene polymer) modified prefabricated seven-layer 3mm thick water proofing membrane, reinforced with non-woven polyester matt over a coat of bitumen primer for bitumen membrane @ 0.25 Kg/sqm. by the same membrane.
12. Providing and fixing float glass panes with putty and nails including removal of old broken panes wherever required.
13. Providing and fixing 10mm thick heavy-duty acid and/or alkali resistant factory made tiles conforming to Group V-RD series of approved make and colour using acid and/or alkali resisting mortar bedding and joints filled with acid and/or alkali resisting.
14. Painting with synthetic enamel paint of approved brand and manufacture to give an even shade.
15. Steel work in built up tubular trusses including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shaped washers etc. complete.
16. Providing and laying water bound macadam with specified stone aggregate, stone screening and binding material including screening, sorting, spreading to template and consolidation with power road roller of 8 to 10 Tonne capacity etc. complete.
17. Earthwork in filling in embankment, guide bunds, around buried type abutments, bridge gaps, trolley refuges, rain bunds, if provided, platforms etc. with earth excavated from outside railway boundary entirely arranged by the contractor at his own cost as per RDSO's latest guidelines and specifications and special condition of contract including all leads, royalty, lifts, ascents, descents, crossing of nallahs or any other obstructions. The rates shall include all dressing of bank to final profile, demarcation and setting out of profile, site clearance, removing of shrubs, roots of vegetations growth, heavy grass, benching of existing slope of old bank, all handling/re-handling, taxes, octroi and royalty etc. as a complete job. Cut trees shall be property of railways and to be deposited in the railway go down unless specified otherwise in the Special Conditions of Contract.
18. 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 3ply veneering with vertical grains or cross bands and face veneers on both faces.

19. Providing and fixing M.S. fan clamp of 16mm dia M.S. bar bent to shape with hooked ends in R.C.C. slabs during laying including painting the exposed portion of loop, all as per standard design complete.
20. Providing and fixing wooden planks in floors, shelves, lofts, decking of bridges, etc., with Kail, venteak, pillamarudhu or locally available comparable species of good country wood.
21. Providing and fixing 25mm thick cup board shutters, with prelaminated flat pressed 3 layer particle board conforming to IS 12823 -Grade I, having one side decorative lamination of approved shade and other side balancing lamination including second class.

For approval of structural drawing:

1. Proof checking of design and drawing from any NIT/ IIT/Government Engineering College with approved building plan and elevation is required.
2. Recommended bearing capacity of soil strata is required.
3. Steel shuttering and scaffoldings shall be utilized for both safety and workmanship. Proper design and drawing for shuttering and scaffoldings shall be prepared along with the structural drawings and got approved by Authority/Authority's representative before execution of work. Minutes of Meeting vide letter no. 04/01-2025/Rly.Bd dt. 13.01.2025 shall be strictly followed.
4. All unwanted materials and construction debris should be removed from the worksites on daily basis.

Special Conditions for Civil/Track Part of Work:

1. The SSE/Works and SSE/PW for the works shall be nominated by DRM/Works/JBP. The measurement of Civil work will be done by nominated Supervisor only.
2. The Civil/Track work shall be carried out under the supervision of the Engineering Department. Necessary measurement of Civil/Track works executed shall be done by Nominated Supervisor and test check by officer nominated by DRM/Works/JBP.
3. The Contractor shall be responsible for the correct setting out of all works in relation to original points, lines and levels of reference at his cost. The Contractor shall execute the work true to alignment, grade, levels and dimensions as shown in the drawing and as directed by the Engineer's representative and check these at frequent intervals. The Contractor shall provide all facilities like labour and instruments and shall cooperate with the Engineer's representative for checking of all alignment, grades, levels and dimensions. If, at any time, during the progress of the works any error appear or arise in any part of the work, the Contractor, on being

required so to do by the Engineer's representative shall, at his own cost rectify such errors, to the satisfaction of the Engineer's representative. Such checking shall not absolve the Contractor of his own responsibility of maintaining accuracy in the work.

4. The Contractor shall carefully protect and preserve all bench marks, sight rails, pegs and other things used in setting out the work. he contractor shall also provide, fix and be responsible for themaintenance of all stakes, templates profiles, levels marks, points etc. must take all necessary precautions to prevent these being removed, altered or disturbed and will be held responsible forthe consequences of such removal, alterations or disturbances should the same take place and fortheir efficient reinstatement.
5. The contractor shall make his own arrangements for water supply. Wherever it is convenient to theRailway Administration, the water from piped supply may be made available to the contractor, provided the contractor shall arranged at his own expenses to effect the connection and lay addition pipes lines and accessories to the site of work and that the contractor shall not be entitledto any compensation for interruption or failure of the water supply. The contractor have to pay forsuch water supply or for supply from Railway well or tube wells at a rate of one percent on the amount of all items or work appearing in the bills payable to the contractor in respect of which work such water has been used by the contractor and such charges shall be deducted from sums due or payable by the railway to the contractor from time to time. Connections to labour camps will not be permitted.
6. The contractor shall make his own arrangements for the operation of mechanical equipment's required for the execution of work and / or for the purpose of lighting for working during day / night time. Wherever, it is convenient to the Railway Administration, the electric supply may be made available to the contractor provided the contractor shall arrange at his own expense to effectthe connections and lay additional wiring provide meter and other accessories on the site. Such work of lying wiring etc. shall be done under supervision of a qualified staff and a certificate shallbe required to be submitted to the effect that the work of wiring has been done as per rules or thework shall have to be got done through Railway Organization and the charges for the same shallhave to be borne by the contractor as per extent rules.
7. The contractor shall not be entitled to any compensation for interruption or failure of the electric supply The contractor will have to pay for such electric supply from Railway at a rate agreed to between contractor and Railway Administration and such charges shall be deducted from the sums due or payable by the Railway to the contractor from time to time.
8. Water available locally in the wells cracks or nallahs may be blackish water at some locations. Itshould be noted that no sea or blackish water shall be used in the all classes of masonry reinforced and mass concrete work. In addition, water used for above work shall be free from earthy, vegetable or organic matter oils, acids and alkaline substances in solutions or in suspensionand impurities and shall be fit for drinking.

9. The rates for all items of the schedule shall be inclusive of all arrangements for crossing an obstruction to be crossed in the course of the work over land or across water and the cost of providing and maintenance of approach / and / or service roads that may be necessary for bringing and removing the plants , machinery and material to and from the site of work including rent for use and / or compensation for damage if any to intervening private land traversed by such approach / service roads, and including cost of acquisition of land, if required for the purpose. The contractor will be permitted to make use of available service roads of the railway free of cost. Railway reserves the right to make use of the contractor's service road without paying any charge to him.
10. The tenderer should note that the rates quoted shall embrace all operations necessary for the satisfactory completion of the work to finish and shall include all charged for handling, transport, lead, lift, labour, housing, sanitation, water supply materials fuel, tools, and plants electric power, workshop facilities, machinery security, lighting etc. and all other expenses of every kind.
11. The contractor shall at all times, adopt such safe methods of working as will ensure safety of structures equipment and labour. Safety rules that should be adhered to are given as guidelines in Appendix 'A'. If at any time, the Railway finds the safety arrangements inadequate or unsafe, the contractor shall take immediate corrective action as directed by the Railway's representative at site. Any directions in the matter shall in no way absolve the contractor of his sole responsibility to adopt safe working methods. The contractor is responsible for providing skilled personnel and adequate expert supervision so as to ensure complete safety.
12. The Contractor shall not carry out any work between sun-set and sun-rise without the previous permission of the Engineer. However, if the Engineer is satisfied that the work is not likely to be completed in time except by resorting to night work, he may order the same without confirming any right on the Contractor for claiming any extra payment for the same.
13. The contractor shall give to the Municipality, Police and other authorities all notices that may be required by the law and obtain all requisite licences for temporary obstruction. Enclosures and payroll fees, taxes, and charges which may be leviable on account of his own operation in executing the contract. He should make good any damage to adjoining premises whether public or private and provide and maintain any light etc. required in night.
14. Figures and dimensions on drawings shall supersede measurements by scale, and drawings to a large scale shall take precedence over those to a smaller scale.
15. No quarters will be provided by the railway for accommodation of the contractor or any of his staff employed on the work. The contractor may be allowed to erect any labour camps for housing the labour at or near the site work on available railway land. The contractor shall at his own cost make all necessary and adequate arrangements for the importation, feeding and preservation of the hygiene of his staff. The contractor shall permit inspection at all times, of all sanitary arrangements made by him by the engineer or his assistant or the medical staff of the Railway. If the contractor fails to make adequate medical and sanitary

arrangements these will be provided by the railway and the cost thereof, will be recovered from the contractor.

16. The contractor shall maintain in a readily accessible place first aid appliance including an adequate supply of sterilized dressing and sterilized cotton wool. The appliances shall be placed under the charge of responsible person who shall be readily available during working hours.

The contractor shall take all precautions against damages from accidents, floods or tides. No compensation will be allowed to the contractor for his tools, plants, materials, machines and other equipment lost or damaged by any cause whatsoever. The contractor shall be liable to make good the damages to any structure or part of a structure, plant or material of every description belonging to the Railway administration, lost or damaged by any cause during the course of contractor's work. The Railway administration will not be liable to pay to the contractor any charges for rectification or repairs to any damage which may have occurred from any cause whatsoever, to any part of the new structures during construction. No claims in this regard will be arbitral.

17. The contractor shall at all times be responsible for any damages or trespass committed by his agents and workmen in carrying out the work, unless such trespass is authorized by the Engineer
18. In the procurement, transport, storage issue and use of explosives the contractor shall abide by the specification and provisions incorporated in the IS Specification No. 4081 – 1967 and IS Specification No. 4756 – 1968 as amended from time to time. He shall also abide by all the rules and regulations provided in the Indian Explosives Act 1984 amended from time to time and such other acts and rules as may be enacted laid from time to time by the Government for such works.
19. Prior to carrying out any blasting the contractor shall obtain the concurrence of the engineers and shall be at all times bound to carry out his instructions regarding provision of blanketing the type number size and placing and firing of charges. Where the blasting is to be carried out close to running line, the engineer may restrict the size and number of shots to be fired at a time so that adjoining tracks and works are not adversely affected and so that the rock beyond the desired profile of the cutting etc. is not cracked or disturbed. Blasting in close proximity to track structures and power lines will be carried out only under traffic power blocks. For works near telephone or telegraph wires, the contractor must advise the engineer in good time, so that he can satisfy himself that safe working methods are being adopted. The contractor will only fire charges at the time notified to him by the engineer and will observe all precautions considered necessary as ordered by the engineer. The contractor will have no claim for damages or loss due to any delay established or claimed to have occurred to the progress of any part of the work as a result of obeying such instructions of the engineer or taking such safety precautions as to the engineer may order to be taken from time to time.
20. The traffic and power blocks required for carrying out the blasting will be settled in advance and the contractor will be advised of the availability of blocks at least 6 hours in advance. If however, the block could not be made available due to any

reason whatsoever, the contractor will have no claim for any loss.

21. Tenderers should note that their vehicles and equipment's can be drafted by the Railway Administration in case of accidents / natural calamities involving human lives"
22. No inflammable materials, such as petroleum oil, etc. within the meaning of the Indian Petroleum Act and Indian Explosives Act shall be stored at site or adjacent land until the approval of the Railway and necessary licence under the Act has been obtained by the Contractor. All due precautions as required under the Act shall be taken by the contractor.
23. The contractor/s shall at his / their cost carry out all anti-larval works as per the Bye- laws of the local authorities concerned or as may be directly by the engineer during the execution of the work under this contracts. If the contractor fails to carry out such work the railway may carry out the same and recover the cost, the fare from the contractor/s in the same way as other Railway amount are recoverable.
24. Period of completion – The railway expects that a resourceful and experienced contractor should be able to complete the work in all respects within (As per milestones) after contract is awarded.

25. SAFETY RULES:-

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra laborer shall be engaged for holding the ladder and if the ladder is used for carrying materials as will, suitable foot-holds and hand holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to ($\frac{1}{4}$ horizontal to one vertical).

2. Scaffolding or staging more than 3.5 meters above the ground or floor swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached bolted, braced and otherwise secured at least 1 meter high above the floor or platform of such scaffolding or staging and extending along the entire

length thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaging from the building or structure.

3. Working platform, gangway and stairways should be so constructed that they should not sag unduly or unequally and where the height of the platform or the gangway or the stairway is more than 3.5 meters above ground level or floor level they should be closely boarded should have adequate width and should be suitably fastened as described in the para above.

4. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 10 metres in length while the width between side rails in swung ladder shall in no case be less than 300 mm for ladder up to and including 3.5 metres in length. For longer ladders this width should be increased by at least 20 mm. For each additional metre of length. Uniform

steps spacing shall not exceed 300 mm ./ Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sides of work shall be so stacked or placed as to cause danger for inconvenience to any persons or the public.

The contractor shall provide all necessary fencing and light to protect the public from accident, and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit action or proceedings to any such persons or which may with the consent of the contractor be paid to compromise any claim by any such person.

5. Demolition before any demolition work is commenced and also during the process of the work:-

- (a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
 - (b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
 - (c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.
6. All necessary personal safety equipment as considered adequate by the Engineer in charge should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by these concerned.
- (a) Workers employed on mixing asphaltic materials, cement and live mortar shall be provided with protective goggles.
 - (b) Those engaged in white washing and mixing or attaching of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
 - (c) Those engaged in welding works shall be provided with welder's protective eye sight lids.
 - (d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
7. In case the contractors have to ply vehicles for the purpose connected with the contract adjacent to Railway track the Railway Administration will be at liberty to post an experienced staff as flagman for guidance of the movements such vehicles so as to prevent accidents and the contractor will bear wages including all etc. of the staff posted as flagman for the period of Contract for such periods during which such staff is posted for the purposes. The Rly Administration will be sole judge in the absolute discretion, of the fact that it is necessary to post any staff, that which of the staff will be suitable for the purpose, that what should be the wages and other allowance payable by the contractor for staff posted for purpose. The Rly Administration will have

a right without prejudice to other remedies to deduct the wages etc. of such staff from the bills of the contractor in respect of this contractor from any moneys or the contractor whatsoever available with the Railway Administration. The contractor will be liable for any over payments under Workman Compensation Act on account of any injury sustained to Railway servant during that period.

8. When the work is done near any place where there is risk of drowning, all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any persons in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
9. Use of hoisting machines and tackle including their attachment anchorage and supports shall conform the following standards or conditions.
 - (a) (i) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good repair and in good working order.
(ii) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.
 - (b) Every Crane driver or hoisting appliances operator shall be properly qualified and no person under the age of 21 years shall be incharge of any hoisting machine including any scaffolding.
 - (c) In case of every hoisting machine and of every cabin ring, shackle, swivel and pulley block used in hoisting or as means of suspension safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with in the safe working load.

In case of hoisting machine having a variable safe working load, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machinery or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
 - (d) In case of departmental machine the safe working load shall be notified by the Electrical Engineer in charge. As regards contractor's machines, the contractor shall notify safe working load of the machine to the Engineer in charge whenever he brings any machinery to site of work, get it verified by the Electrical Engineer concerned.
10. Motors, gearing transmission electric wiring and of the dangerous part of hoisting appliances should be provided with efficient safe guards, hoisting appliances should be provided with such means will as reduce to the minimum the risk of accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized insulating mats, wearing apparel, such as gloves, sleeves and both as may be necessary should be provided. The workers should not wear any rings, watches and

carry keys or other materials which are goods conductors of electricity.

11. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.
12. These safety provisions should be brought to the notice of all concerned display on a notice board at a prominent place at the work spot. The persons responsible for compliance of the safety code shall be named herein by the contractor.
13. To ensure effective endorsement of the Rules and Regulations relating to safety precautions, the arrangements made by the contractor shall be opened to inspection by Labour Officer / Engineer in charge of the department or their representative.
14. Notwithstanding the above clause from (1) to (12) there is nothing in these except the contract or the operation of the any other act of rules in force in the Republic of India.

27. Special Condition Regarding cement and steel to be provided by the contractor.

1. Cement and steel for use in the work should be procured by the contractor from the main producers/their authorized dealers/authorized stock yards should conform to latest IS Specifications.

I.CRS, TMT-415 or 500 STEEL BAR CONFORMING TO IS 1786-1985.

2. Cement bags preferably in paper bags to packing should bear the following information in legible markings :-

- i) Manufactures' name.
- ii) Registered trade mark of manufactures, if any.
- iii) Weight of each bag in Kgs or no. of bags/tonne.
- iv) Date of manufacture, generally marked as week of the year/year of manufacture e.g. 30/93 which means 30th week of 1993.
- v) Type of Cement.

3. To ensure quality control, test certificate from the manufacturer should be produced by the contractors which should conform to the relevant latest specifications.

4. Railways may also take samples during the course of work and get the cement and steel tested to ascertain their conformity to specifications.

5. The Sampling should be as per IS Specifications.

6. Tests on the samples will be carried out in the field should be as given below.

Tests on cement to be as per IS 4031, same of the tests which may be carried out are :-

- i) Compressive strength.
- ii) Initial and final setting time.
- iii) Consistency.
- iv) Soundness.
- v) Test on steel samples will be carried out as per IS Specifications.

Note :- Test Certificates for cement and steel shall be produced by the

contractor. (Senior Divisional Engineer (Co-ord)'s Office Note No. JBP/W/RATE/T.14 DATED 18.10.2004)

"All the material required for execution of the work shall be from reputed manufactures/brands conforming to standard Railway specification/IS specifications and duly approved by engineering incharge or his representative. Offer of any other quality shall be summarily rejected "

Debris :-All debris from the work site will be disposed by the contractor at his own cost.

Note:

All works will be executed as per latest IR Signal Engineering Manual Telecom Manual, RDSO Guidelines, West central Railway practices and above given specifications and drawings. If no such guidelines are available or if there are any deviations then the prior approval of the Authority Engineer will be mandatory before installation or execution of works.

Items where RDSO approved sources are available should be procured from RDSO approved sources and should be inspected by RDSO as per the Inspection Policy of RDSO. Critical itemsshall be inspected by RDSO asper RB's L/No. 74/RS(G)/379/2 Pt. Dated 04/03/91 & 18/06/91. For items other than critical items RB's L/No. 2000-RS (G)/379/2 dated 06/09/2017 to be followed.

Inspection certificates from the RDSO/ RITES to be submitted to authority before supply & Installation.

Items with specifications not mentioned or any discrepancy/deviation in specification of any items should be supplied and installed only after approval of the Authority's Engineer.

SECTION – III: MINIMUM SCOPE OF WORK

- 1.0 This project is for Provision of KAVACH in the entire sections of JBP division described in Section-I. The overview of the project requirements has also been furnished in the previous section.
- 1.1 The work is to be executed as per provisions of the Indian Railway Signal Engineering Manual (IRSEM) with latest correction slips, Specifications of the systems & latest guidelines issued by Railway Board & RDSO, approved Signalling Plans and WCR's guidelines (if any).

1.2 Quantified Scope of work for KAVACH:

SN	Description of work	Detailed scope of work of KAVACH (Train Collision Avoidance System) along with CAB Signalling								
		Details of block section		On Board Loco KAVACH Equipm ent, Antenn a, Tacho meter etc.	Stationary/LC/IBS KAVACH equipments				section	Block section
		From (KM)	To (KM)		Way side station	Junctio n station	IBS KAVACH/RIU	LC KAVACH/RIU		
1	Survey, design, supply, installation, testing, manuals for new technology equipment installed for each place, supply of completion drawings, and commissioning of KAVACH (Train Collision Avoidance system)	ITARSI-MANIKPUR, Mahdeiya -BINA MALKHERI-MAHADEOKHE RI, Entire KATNI Complex, BINA MALKHERI-AGASOD, SATNA-REWA, KAIMA-SAGMA, BANSAPAHAR – OHAN		32	97 stations through S-Kavach	11 Junction stations through S-Kavach	46 IBS KAVACH	06 LC KAVACH + 55 through RIU)	Third Line section NMWP-GEA, BNU-ANA, PHA-MAKR) Double line between ET-MKP, GEA-BNU, ANA-PHA, KTE-BEHR, JOBA-GNDI, STA-HNM, TZR-REWA) Single Line (HNM-TZR, BEHR-JOBA)	Complete Absolute Block section except Automatic Block section in Baghora-MAKR
2	Inventory for KAVACH: 2.1 NMS along with accessories 2.2 KMS for communication between Stationary KAVACH & OB KAVACH: KMS server configuration/ integration in						Supply of spares Quantity with unit • 10% spares with minimum of 1 nos shall be provided at card/module level for each type of card/module for each LC/IBH/STN			

	existing KMS server for KAVACH 2.3 Simulator/Lab Model for Station equipment, Loco equipment, trackside components-----02 2.4 Test Bench for Station KAVACH-----01 Test Bench for Loco KAVACH-----02 2.5 Measuring Equipment for Station -----05 2.6 Tool Kit for Configuration for RFID Tags. Toolkit should be complete in all respects of both hardware and software, such that any alteration or configuration can be done by Railway Personnel ...11 2.7 e-learning Manuals for Station & Onboard....05 set 2.8 Aerial Videography (UAV-Drone) Record.....10 set 2.9 Drawing & Documentation..... 06 set per site(station/LC/IBS KAVACH& each RIU) 2.10 Training to Railway officials .. as mentioned in document. 2.11 Application Safety Case .. 01 set . 2.12 Interfacing material of all sorts.. 01 lump sum 2.13 Lightening & surge protection arrangement... At every KAVACH location (Station, LC & IBS) 2.14 Setup of FAT facility for KAVACH system design testing at Katni and Jabalpur. 2.15 PC console along with hardware for entering PSR Data. 2.16 Provision of all documents & Drawings for WPC & SACFA clearance. 2.17 Provision of all documents related to Wildlife/Forest Clearance Note: 1. Any other work or supply which is required for successful commissioning of KAVACH shall be provided free of cost by the Contractor.	KAVACH/ On Board KAVACH, RIU units etc • 20 % spares for RFID tags and Relays • Spares shall be provided at Signal Depot at JBP, Katni, Satna, Damoh for works of S&T Project JBP unit. These spares are in addition to fully wired and equipped KAVACH provided at Stations/LC gates/IBS/ LOCOs and spares as specified vide RDSO specifications.
3	Integrated testing and commissioning	Complete section –All stations, LCs, IBH, RIU & Loco KAVACH

Note:

1. As work of third line is in progress in KMZ-BINA section and is expected to complete before execution of Kavach works, hence, estimated cost of project includes the requirements of 3rd line between KMZ-BINA. Similarly, estimated cost of project included complete system requirements as per Double line between NKJ-Mahdeiya and STA-REWA section where work of Double line is in progress. Additional amount on this account is not payable.
2. These requirements are only indicative & may change as per actual survey and design of KAVACH system.

SECTION – IV: GENERAL REQUIREMENTS

- 1.1 All associated materials and works for completion not limited to items in the above table as required for execution of the Signalling/Kavach works to suit 25 KV has to be provided by the Contractor.
- 1.2 All these requirements are only indicative & may change as per actual design of Indian Railway Automatic Train Protection system.
- 1.3 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” with latest correction slips and “Indian Railways Schedule of Dimensions” as modified from time to time unless deviation, 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.
- 1.4 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.
- 1.5 All materials and equipment to be supplied and used in execution of the work should conform to IRS/IS with latest amendments wherever applicable.
- 1.6 All drawings/specifications shall be read with latest alterations.
- 1.7 All the test reports shall be signed by the contractor’s Engineer.
- 1.8 The Contractor shall transport all the released materials to railway depots nominated by the Authority’s Engineer.
- 1.9 All the materials required for execution and successful completion of Kavach shall be supplied and installed by the contractor unless specified otherwise and specifically mentioned.
- 1.10 On completion of above works, testing and commissioning of entire system in totality shall be carried out by the Contractor.
- 1.11 Painting color scheme of newly installed signal posts and fittings, apparatus cases etc. shall be as per provisions of IRSEM.
- 1.12 Double locking arrangement is to be provided at each ABS hut RR, LC/IBH service building RR and RR extensions at stations.
- 1.13 E-type lock is to be provided at steel door (Door D1 in the drawing (Annexure-1C) of ABS hut.