CHAPTER- I

Item No.	Description of work	Unit	Rate
1	2	3	4
101	Preparation of cable route plan, cable core chart, power supply arrangement, circuit route termination chart, cable termination chart in relay room and Apparatus Cases, Apparatus Cases wiring plan, Cable Insulation chart, Earth resistance chart, Track circuit Test Card, Signal Lamp/LED Register, Battery History Card, Fuse Analysis chart, Equipment disposition plan, polarity chart (Track insulation plan), terminal and contact analysis plans, Track Bonding Plan, Station Working Rule Diagram (SWRD) and obtaining approval of Competent Authority for MACLS Station as per Item No. 18 of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	56864
102		Medium Stn. 4 Lines	72618
103		Big Stn. 5-6 Lines	86060
104	Design and preparation of wiring diagram for MACLS station on the basis of approved interlocking plan, typical circuit diagram supplied along with tender paper and as per Railway practice and latest rules prescribed by the Railway and obtaining approval of the competent authority. Preparation of locking tables and dog charts to suit colour light signalling plan and obtaining the approval of the competent authority as per Item No. 18 of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	59858
105		Medium Stn. 4 Lines	66651
106		Big Stn. 5-6 Lines	77600
107	Preparation of cable route plan, cable core chart, power supply arrangement, circuit route termination chart, cable termination chart in relay room and Apparatus cases, Apparatus cases wiring plan, cable Insulation chart, Earth Resistance Chart, Track circuit Test Card, Signal Lamp/LED Register, Battery History Card, Fuse Analysis chart, Equipment disposition plan, polarity chart (Track insulation plan), terminal and contact analysis plans, Track Bonding Plan, Station Working Rule Diagram (SWRD) and obtaining approval of Competent Authority for PI with MACLS Station as per Item No. 18 of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	55541
108		Medium Stn. 4 Lines	62228
109		Big Stn. 5-6 Lines	71036
109(a)		Big Stn. 7-9 Lines	107925
109(b)		Big Stn. 10-12 Lines	141517
109(c)		Big Stn. 13-15 Lines	209664
110	Design and preparation of operating cum indication panel diagram domino type along with circuit diagram of Panel interlocking with MACLS station and preparation of control panel diagram, route section	Small Stn. 2-3 Lines	75244
111		Medium Stn. 4 Lines	101572

Item No.	Description of work	Unit	Rate
112	plan, square sheet, wiring chart and selection table etc and other interconnection drawings with relay room, equipment room etc. on the basis of approved colour light signalling plan supplied by RE and typical circuit diagram as per Railway practice and obtaining approval of competent authority. The operating cum indication panel may have additional alteration to an extent of 5% variation in no of dominos as per Item No. 18 of Technical Specification of Enclosure-I.	Big Stn. 5-6 Lines	126748
112(a)		Big Stn. 7-9 Lines	187756
112(b)		Big Stn. 10-12 Lines	253495
112(c)		Big Stn. 13-15 Lines	379962
113	Preparation of cable route plan, cable core chart, power supply arrangement, circuit route termination chart, cable termination chart in relay room and Apparatus cases, Apparatus cases wiring plan, cable Insulation chart, Earth Resistance Chart, Track circuit Test Card, Signal Lamp/LED Register, Battery History Card, Fuse Analysis chart, Equipment disposition plan, polarity chart (Track insulation plan), terminal and contact analysis plans and obtaining approval of Competent Authority for Level -Xing gate MACLS as per Item No. 18 of Technical Specification of Enclosure-I.	Level Crossing gate MACLS	18578
114	Design and preparation of wiring diagram for Level-Xing MACLS on the basis of approved interlocking plan, typical circuit diagram supplied along with tender paper and as per Railway practice and latest rules prescribed by the Railway and obtaining approval of the competent authority. Preparation of locking tables and dog charts to suit colour light signalling plan and obtaining the approval of the competent authority as per Item No. 18 of Technical Specification of Enclosure-I.	Level Crossing gate MACLS	16948
115	Modification to existing drawings for stations provided with MACLS such as circuit diagram, cable route plan, cable core chart, power supply diagram, track circuit test card, signal lamp/LED card, battery history card etc. polarity chart (Track Insulation plan), inter connection drawing with Relay Room and Equipment room etc. Locking table and dog chart on the basis of approved signalling plan. Square sheet modification/ preparation of cable termination chart in Relay Room and Apparatus cases, Apparatus cases Wiring Plan, Cable Insulation chart, Earth resistance chart, circuit	Small Stn. 2-3 Lines	79696
116		Medium Stn. 4 Lines	91155
117		Big Stn. 5-6 Lines	102523
117(a)		Big Stn. 7-9 Lines	154445

Item No.	Description of work	Unit	Rate
117(b)	route termination chart, equipment disposition plan, Fuse analysis chart, terminal analysis and contact analysis plans, Track Bonding plan, Station Working Rule Diagram (SWRD) and obtaining approval of competent authority for the above work for MACLS Station. Refer item 18 of Technical Specification of Enclosure-I.	Big Stn. 10-12 Lines	205023
117(c)		Big Stn. 13-15 Lines	307255
118	Modification to all existing drawings to suit revised RE plan for stations provided with panel interlocking with MACLS and preparation/ alteration of SWR control panel diagram, route section plan, polarity chart (Track insulation plan). Square sheet, wiring chart and selection table etc. and other inter connection drawings with Relay room, equipment room etc. on the basis of approved colour light signalling plan supplied by RE and typical circuit diagram, modification /preparation of cable termination chart in relay room and Apparatus cases, Apparatus cases wiring plan, square sheet chart, Cable insulation chart , Earth resistance chart , circuit route termination chart, equipment disposition plan, fuse analysis chart, terminal analysis and contact analysis plan, Track Bonding Plan, Station Working Rule Diagram (SWRD) as per Railway practice and obtaining approval of competent authority for PI with MACLS station. Refer item No. 18 of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	109765
119		Medium Stn. 4 Lines	119261
120		Big Stn. 5-6 Lines	138777
120(a)		Big Stn. 7-9 Lines	208127
120(b)		Big Stn. 10-12 Lines	277555
120(c)		Big Stn. 13-15 Lines	402449
121	Modification to existing drawings for stns. provided with Level Crossing gate MACLS such as circuit diagram, cable route plan, cable core chart, power supply diagram, Signal lamp/LED card, battery history card etc. inter connection drawing with Relay Room and Equipment room etc. Locking table and dog chart on the basis of approved signalling plan. Square sheet, modification/ preparation of cable termination chart in Relay Room and Apparatus Cases, Apparatus cases Wiring Plan, Cable Insulation chart, Earth resistance chart, circuit route termination chart, equipment disposition plan, Fuse analysis chart, terminal analysis and contact analysis plans, Station Working Rule Diagram (SWRD) and obtaining approval of competent authority for the above work for Level crossing gate. Refer item 18 of Technical Specification of Enclosure-I.	Level Crossing gate MACLS	21643

CHAPTER- II

1	2	3	4
201	Trenching in all type of soil (Normal soil, Hard soil & Black cotton soil) and refilling of trenches from distant to distant signal on either side of station along side track and in yard as per item-1 of Technical Specification of Enclosure- I (for 1.0 meter depth).	Km.	48921
201(a)	Trenching in all type of soil (Normal soil, Hard soil & Black cotton soil) and refilling of trenches from distant to distant signal on either side of station along side track and in yard as per item-1 of Technical Specification of Enclosure- I (for 1.2 meter depth).	Km.	59312
202	Supply and fixing of metallic cable marker is to be done as per drg. no. CORE/S&T/ALD/ SK/ 373/93 page 10 Alt. – 'A' as per item-1 of Technical Specification of Enclosure-I.	No.	487
202(a)	Fabrication, Supply and fixing of RCC cable marker is to be done as per drg. no. CORE/S&T/ALD/ SK/ 600/ 2013 & item-1 of Technical Specification of Enclosure-I.	No.	145
203	Supply, placing and positioning width wise of second-class country made Bricks above the screened earth after laying the cable. (placing of bricks @ eight to nine bricks to cater one meter length)	No.	5.55
204	Supply, placing and positioning length wise of second-class country made Bricks at the rate of 4 bricks per meter required for separation of power cable and signalling cable.	No.	5.60
205	Trenching under road/ Rail and refilling of trenches as per item-1 of Technical Specification of Enclosure- I (1.0 meter depth).	Mtr.	130
206	Construction of brick masonry channel as per drg. No. RE/ S&T/ SIG/ TENDER/ SK/ 14 /85, in case rock is encounter after a depth 200 MM-500 MM and if full depth digging is not feasible.	Mtr.	383
207 (a)	Trenching on Low level platform & refilling of trenches as per item-1 of technical specification of enclosure- I (1.0 meter depth)	Mtr.	94
207 (b)	Trenching, refilling & cement concreting on platform as per item-1 of technical specification of enclosure-I. (1.0 meter depth).	Mtr.	240
208	Supply & laying of RCC pipe of 150 mm dia. 2 meter long in trenches under Road/ Track Crossing as per item-1 (IV) of Technical Specification of Enclosure-I & IS specification No. 458/1971.	No.	698
209	Supply of G.I. Trough as per drg. No.	Mtr.	1109

	RE/S&T/Sig./Tender /22 /85 and fixing of G.I. troughs on girder bridges as per drg. No. RE/ S&T/Sig./Tender/SK/23/ 85 dtd. 20.4.1985 and refilling of trough with bitumen compound of specification no. IS-7084/73 clause (4) after the cable is laid.		
210	**Deleted**		
211	Laying of signalling cable of different sizes as per cable route plan approved by Railway and meggering of main and tail cables as per item No.1 of Technical Specification of Enclosure-I. (2 core to 37 core 1.5/2.5 Sq.mm) and 2 core 25 Sq.mm Aluminums power cable.	Km.	19015
212	Supply & laying of RCC split pipe of 150 mm dia. 2 meter long in trenches near traction substation as per Technical Specification of Enclosure-I, item-1 (VII) & IS specification No. 458/1971	No.	646
213(a)	All work pertaining to Horizontal Directional Drilling (HDD)/Boring and trenchless cabling. It includes supply, transportation and insertion of self lubricated HDPE Pipe(inner dia. 50mm and outer dia. 63mm) and laying of cables in boring under the track/road by using different sizes of pipes depending on total number of cables will be crossed. The depth of horizontal boring should be minimum 1 mtr. from rail flange/road level. This item will be used for track/road crossing or any other location decided by Engineer in charge with specific approval of DyCSTE/RE of Project (for other than track/road crossing).	Mtr.	984
213(b)	All work pertaining to Horizontal Directional Drilling (HDD)/Boring and trenchless cabling. It includes supply, transportation and insertion of self lubricated HDPE Pipe (inner dia. 103.5mm and outer dia. 120mm) and laying of cables in boring under the track/road by using different sizes of pipes depending on total number of cables will be crossed. The depth of horizontal boring should be minimum 1 mtr. from rail flange/road level. This item will be used for track/road crossing or any other location decided by Engineer in charge with specific approval of DyCSTE/RE of Project (for other than track/road crossing).	Mtr.	1279
213(c)	All work pertaining to Horizontal Directional Drilling (HDD)/Boring and trenchless cabling. It includes supply, transportation and insertion of self lubricated HDPE Pipe(inner dia. 175 mm and outer dia. 200mm) and laying of cables in boring under the track/road by using different sizes of pipes depending on total	Mtr.	2165

	number of cables will be crossed. The depth of horizontal boring should be minimum 1 mtr. from rail flange/road level. This item will be used for track/road crossing or any other location decided by Engineer in charge with specific approval of DyCSTE/RE of Project (for other than track/road crossing).		
214(a)	Supply, transportation and laying of Double Wall Corrugated (DWC)-HDPE pipe/duct (inner dia. 175 mm and outer dia. 200 mm)in the cable trench parallel to the track and decided by site engineer in charge .It includes supply and insertion/laying of Double Wall Corrugated -HDPE pipe/duct as per RDSO Specn. No. RDSO/SPN/204/ 2011 or latest and conforming to Spec. No.IS·14930, Part-II. The DWC-HDPE pipe/duct will be ANTI RODENT type and shall include supply and installation of accessories of DWC-HDPE duct/pipe like plastic coupler (push fit type with O-ring), end caps, T-Joints etc. The DWC-HDPE pipe/duct will be inspected by RDSO/RITES with the sample passed all prescribed test by RDSO like compression test, impact test, bending test, oxidation induction test etc. The contractor will submit the test reports.	Mtr.	293
214(b)	Supply, transportation and laying of Double Wall Corrugated (DWC)-HDPE pipe/duct (inner dia. 103.5 mm and outer dia. 120 mm)in the cable trench parallel to the track and decided by site engineer in charge .It includes supply and insertion/laying of Double Wall Corrugated -HDPE pipe/duct as per RDSO Specn. No. RDSO/SPN/204/ 2011or latest and conforming to ISI Spec. No.IS·14930, Part-II. The DWC-HDPE pipe/ duct will be ANTI RODENT type and shall include supply and installation of accessories of DWC-HDPE duct/pipe like plastic coupler (push fit type with O-ring), end caps, T- Joints etc. The DWC-HDPE pipe /duct will be inspected by RDSO/RITES with the sample passed all prescribed test by RDSO like compression test, impact test, bending test, oxidation induction test etc. The contractor will submit the test reports.	Mtr.	204
215	Supply of perforated G.I. Pipe (medium class, Nominal bore 80 mm) confirming to IS: 1239 as mentioned in drg. No. RE/S&T/SIG/TENDER/ SK/ 596/2011	Mtr.	585
216	Supply of Collar for G.I. Pipe (medium class, Nominal bore 80 mm) confirming to IS: 1239.	No.	239

217	Fixing of perforated G.I. Pipe of required length at a culvert as per drg. No. RE/S&T/SIG/ TENDER/ SK/596/2011.	Mtr.	60

CHAPTER- III

1	2	3	4
301	Casting, concreting & curing of foundation for main signal as per item 2 of Technical Specification of Enclosure- I.	No.	9678
302	Casting, concreting & curing of foundation for Shunt signal as per item 2 of Technical Specification of Enclosure- I.	No.	4666
303	Casting, concreting & curing of foundation & erection for Single apparatus case as per item 2 of Technical Specification of Enclosure- I.	No.	4770
304	Casting, concreting & curing of foundation & erection for half apparatus case as per item 2 of Technical Specification of Enclosure-I.	No.	4057
305	Casting, concreting & curing of foundation & erection for Junction boxes as per item 2 of Technical Specification of Enclosure- I.	No.	3630
306	Casting, concreting & curing of foundation & erection for SLB/BSLB/SB as per item 2 of Technical Specification of Enclosure-I.	No.	2591
307	Supply & fixing of terminal strip, Hylam strip, fuses with base & shelves for single apparatus cases & fixing of fuses, ARA terminals and wiring of all equipments including relays as per item 3 of Technical Specification of Enclosure-I.	No.	8362
307 (a)	Supply & fixing of MS angle, Hylam sheet, fuses with base & shelves for single apparatus cases. Fixing of ARA terminals and wiring of all equipment including relays as per item 3(III), (IV), (V) and item 13 of Technical Specification of Enclosure-I.	No.	9242
308	Supply & fixing of terminal strip, Hylam strip, fuses with base & shelves for half apparatus case, fixing of fuses, ARA terminals and wiring of all equipments including relays as per item 3 of Technical Specification of Enclosure-I.	No.	5840
308 (a)	Supply & fixing of MS angle, Hylam sheet, fuses with base & shelves for half apparatus cases. Fixing of	No.	6002

1	2	3	4
	ARA terminals and wiring of all equipment including relays as per item 3(III), (IV), (V) and item 13 of Technical Specification of Enclosure-I		
309	Supply & fixing of terminal strip, Hylam strips for junction boxes and fixing of ARA terminals as per item 3 of Technical Specification of Enclosure-I.	No.	2790
309 (a)	Supply & fixing of MS angle, Hylam sheet for Junction Boxes and fixing of ARA terminals as per item 3(III), (IV), (V) and item 13 of Technical Specification of Enclosure-I.	No.	2590
310	Supply of SLB/BSLB/SB; for SLB/BSLB Ref. RDSO Drg. No. SA 2373 (with latest amendment).	No.	5433
311	Alteration of wiring in existing apparatus cases single/half. This includes supply of all materials in connection with alteration in wiring except Railway supply items and ARA terminals.	No.	5695
312	Supply of Colour Light Signal post 3.6 meter and ladder 3.5 meter with base.	No.	10031
313	Supply of CLS post 4.6 meter and ladder 4.5 meter with base.	No.	11285
314	Supply of Colour Light Signal post 5.6 meter and ladder 5.5 meter with base.	No.	15823
315	Supply of Colour Light Signal unit 2 Aspect complete with lenses and lamps, without signal transformers.	No.	13902
315 (a)	Supply of Colour Light Signal unit 2 Aspect complete without lenses, lamps & signal transformers.	No.	11305
316	Supply of Colour Light Signal unit 3 Aspect complete with lenses and lamps, without signal transformers.	N0.	18028
316 (a)	Supply of Colour Light Signal unit 3 Aspect complete without lenses, lamps & signal transformers.	No.	14042
317	Supply of Colour Light Signal unit 4 Aspect complete with lenses and lamps, without signal transformers.	No.	21085
317 (a)	Supply of Colour Light Signal unit 4 Aspect complete without lenses and lamps & signal transformers.	No.	15708
318	Supply of Colour Light Signal unit 3 Aspect with one way route indicator complete with lenses and signal lamps & offset bracket 140 mm outside dia. without signal transformers.	No.	36316
318 (a)	Supply of Colour Light Signal unit 3 Aspect with one way route indicator complete offset bracket 140 mm outside dia. and without lenses, lamps and signal transformers.	No.	32812
319	Supply of Colour Light Signal unit 3 Aspect with two way route indicator complete with lenses and lamps	No.	41161

1	2	3	4
	& offset bracket 140 mm outside dia. without signal transformers.		
319 (a)	Supply of Colour Light Signal unit 3 Aspect with two way route indicator with offset bracket 140 mm outside dia. and without lenses, lamps and signal transformers.	No.	33247
320	Supply of Colour Light Signal unit 3 Aspect with three way route indicator complete with lenses and lamps & offset bracket 140 mm outside dia. without signal transformers.	No.	46478
320 (a)	Supply of Colour Light Signal unit 3 Aspect with three way route indicator with offset bracket 140 mm outside dia. and without lenses, lamps and signal transformers.	No.	36817
321	Supply of Colour Light Signal unit 3 Aspect with four way route indicator complete with lenses and lamps & offset bracket 140 mm outside dia. without signal transformers.	No.	51793
321 (a)	Supply of Colour Light Signal unit 3 Aspect with four way route indicator with offset bracket 140 mm outside dia. and without lenses, lamps and signal transformers.	No.	40387
322	Supply of Colour Light Signal unit 2 Aspect with one way route indicator complete with lenses and lamps & offset bracket 140 mm outside dia. without signal transformers.	No.	31720
322 (a)	Supply of Colour Light Signal unit 2 Aspect with one way route indicator with offset bracket 140 mm outside dia. and without lenses, lamps & signal transformers.	No.	26940
323	Supply of Colour Light Signal unit 2 Aspect with two way route indicator stencil type complete with lenses and lamps & offset bracket 140 mm outside dia. without signal transformers.	No.	32418
323 (a)	Supply of Colour Light Signal unit 2 Aspect with two way route indicator stencil type complete with offset bracket 140 mm outside dia and without lenses, lamps & signal transformers.	No.	29821
324	Supply of Colour Light Signal unit 2 Aspect with two way route indicator complete with lenses and lamps & offset bracket 140 mm dia. without signal transformers.	No.	37036
324 (a)	Supply of Colour Light Signal unit 2 Aspect with two way route indicator & offset bracket 140 mm outside dia. and without lenses, lamps & signal transformers.	No.	30510
325	Supply of Colour Light Signal unit 2 Aspect with three	No.	42352

1	2	3	4
	way route indicator complete with lenses and lamps & offset bracket 140 mm dia. without signal transformers.		
325 (a)	Supply of Colour Light Signal unit 2 Aspect with three way route indicator & offset bracket 140 mm outside dia (without lenses, lamps & signal transformers.)	No.	34080
326	Supply of position light shunt signal unit with lenses and lamps & offset bracket 3 1/2" dia. without signal transformers.	No.	5568
326 (a)	Supply of position light shunt signal unit & offset bracket 3 1/2" dia. and without signal transformers, lenses and lamps)	No.	4651
327	Supply of position light shunt signal unit with lenses, lamps, base & post without signal transformers.	No.	7528
327 (a)	Supply of position light shunt signal unit with base & post and without lenses, lamps & signal transformers.	No.	6152
328	Installation, erection and wiring of Colour Light Signal 2 aspect complete as per item-4/ item-17 of Technical Specification of Enclosure-I.	No.	6989
329	Installation, erection and wiring of Colour Light Signal 3 aspect complete as per item-4/item-17 of Technical Specification of Enclosure-I.	No.	7094
330	Installation, erection and wiring of Colour Light Signal 4 aspect complete as per item-4/ item-17 of Technical Specification of Enclosure-I.	No.	8412
331	Installation, erection and wiring of 2 aspect/3 aspect /4 aspect color light signal with 1way/2way/3way route indicator as per item-4/item-17 of Technical Specification of Enclosure-I.	No.	11481
332	Installation, erection and wiring of independent position light shunt signal as per item-4/item 17 of Technical Specification of Enclosure-I.	No.	4353
333	Installation, erection and wiring of calling on signal/ shunt signal on same post below Main signal as per item-4/ item 17 of Technical Specification of Enclosure-I.	No.	3842
334	Shifting of existing color light signal with foundation along the track to meet the schedule of dimension required in connection with RE modification.	No.	32588
335	Provision of screen on signal when they fall within two meter from live conductor by expanding Metal size 20mm X 60mm (strand 3.25 mm wide and 1.6 mm thick) as per instruction at site by Engineer incharge. This includes supply of all materials including earth electrode and earthing arrangement.	No.	9040
336	**Deleted**		

1	2	3	4
337	**Deleted**		
338	Wiring, testing and commissioning of existing electric point detector as per item 5 of Technical Specification of Enclosure-I.	No.	3993
339	**Deleted**		
340	**Deleted**		
341	Supply and installation of facing point operation layout and facing point lock layout with lock and lock bar and connection of points /lock bars starting from lever in cabin and connection up to points/lock bars. This includes making of connecting rods, fixing of various cranks, compensators, A & B type foundations, radial guides, trestles, roller guide assembly, point solid rodding 32 mm, solid joints, screw joints and point adjusting screw etc. Casting of foundations for cranks and compensators and making lead out including smithy works as per item no. 5 of Technical Specification of Enclosure-I. Lever shall be supplied by railway but will be installed by the contractor, if required. NOTE: Point rodding (solid) will be supplied by the Railway for the above work.	No.	108059
342	Supply and installation of all material for facing point lock layout without lock bar and connection of facing point lock starting from lever in cabin and connection up to the facing point lock. This includes making of connecting rods, fixing of various cranks, compensators, A & B type foundations, trestles, roller guide assembly, point solid rodding 32 mm, solid joints, screw joints and point adjusting screw etc. Casting of foundations for cranks and compensators and making lead out including smithy works as per item no. 5 of Technical Specification of Enclosure-I. Rack & Pinion Lever shall be supplied by Railway but will be installed by the contractor. NOTE: Point rodding (solid) will be supplied by the Railway.	No.	89288
343	Supply and installation of all material for route holding bar and connections starting from lever in cabin up to the route holding bar. This includes making of connecting rods, fixing of various cranks, compensators, A & B type foundations, radial guides, trestles, roller guide assembly, point solid rodding 32 mm, solid joints, screw joints etc. Casting of foundations for cranks and compensators and making	No.	74733

1	2	3	4
	lead out including smithy works as per item no. 5 of technical specification of enclosure- 1. (With extension of same rodding run i.e. relevant lock bar in the route). NOTE: Point rodding (solid) will be supplied by the Railway.		
344	Supply and installation of all material for route holding bar and connections starting from lever in cabin up to the route holding bar. This includes making of connecting rods, fixing of various cranks, compensators, A & B type foundations, radial guides, trestles, roller guide assembly, point solid rodding 32 mm, solid joints, screw joints etc. Casting of foundations for cranks and compensators and making lead out including smithy works as per item no. 5 of Technical Specification of Enclosure-I. (With new lever). NOTE: Point rodding (solid) will be supplied by the Railway.	No.	100788
345	Supply and installation of all material with ground connection except point rodding (solid) for siding point as per item no. 5 (VII) of Technical Specification of Enclosure-I. (With new lever). NOTE: Point rodding (solid) will be supplied by Railway.	No. of Cross Over Point	107672
346	**Deleted**		
347	Modification of existing Rotary Key Transmitter suitable for RE area as per drg.no.SA2260/M for siding point /LC Gate as per circuit diagram. This includes supply of all materials for installation of RKT as per item 5(VI) of Technical Specification of Enclosure-I.	One Pair of RKT	4935
348	Supply & installation of all material for bolt detection on facing point.	No.	6418
349	Removing of existing point connecting gears, fixing of point machine to the sleeper & rod connections. Fixing of cable connection box & connection of tail cable, wiring, testing & final adjustment. This includes supply of all materials except Electric Point Machine, Guage tie plate, Stretcher bar and wooden sleeper.	No.	11393
350	Provision of crank handles locking arrangement on point machine to suit ward group and KLCR.	Set.	2060
351	Removal of existing point motor and installation of	No.	2914

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	immunized motor. Note:-Immunized Motor will be supplied by Railway.		
352	**Deleted**		
352 a)	**Deleted**		
352 b)	**Deleted**		
352(c)	**Deleted**		
353	**Deleted**		
353(a)	**Deleted**		
353(b)	**Deleted**		
353(c)	**Deleted**		
354	**Deleted**		
354(a)	**Deleted**		
354(b)	**Deleted**		
354(c)	**Deleted**		
355	**Deleted**		
355(a)	**Deleted**		
355(b)	**Deleted**		
355(c)	**Deleted**		
356	**Deleted**		
357	Supply and fitting of "E" type lock with all accessories for Relay Room/ Equipment Room/ Battery Room	No.	870
358 (a)	Cleaning , scraping, painting and lettering of all newly installed and existing gears by the contractor for Colour Light Signalling Station as per item 10 (I & II) of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	19588
358 (b)		Med. Stn 4 Lines	24107
358 (c)		Big Stn. 5-6 Lines	30370
358 (d)		Big Stn. 7 - 9 Lines	38367
358 (e)		Big Stn. 10-12 Lines	48688
358 (f)		Big Stn. 13-15 Lines	60930
359 (a)	Cleaning, scraping, painting and lettering of all newly installed and existing gears by the contractor for panel interlocked Station as per item 10 (I &II) of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	22743
359 (b)		Med. Stn 4 Lines	26006
359 (c)		Big Stn. 5-6 Lines	33879
359 d)		Big Stn. 7 - 9 Lines	41344

1	2	3	4
359 (e)		Big Stn. 10-12 Lines	52612
359 (f)		Big Stn. 13-15 Lines	65451
360	Cleaning, scraping, painting and lettering of all newly installed and existing gears by the contractor for Level Crossing Gates as per item 10 (I &II) of Technical Specification of Enclosure-I.	LC Gate	8871
361	Supply and fixing of P/G/C marker with complete fittings.	No.	816
362	**Deleted**		
363	Supply of Terminal Block M6(ARA Terminal)as per IRS specification No.IRS-S-75-91(Latest) and IRS Drawing No. SA23741/A (Alteration 4)	No.	43
364	Supply of Apparatus case steel single as per sketch No.RE/S&T/ALD/SK/219/82 with alteration 'A' and 221/82 with alteration 'B'. The key & handle should be at rate of one each per 4 apparatus cases.	No.	14253
365	Supply of Apparatus case steel Half as per sketch No.RE/S&T/ALD/SK/220/82 with alteration 'A' and 221/82 with alteration 'B' .The key & handle should be at rate of one each per 4 apparatus cases.	No.	9886
366	Supply of Junction box as per sketch No. RE/S&T/ALD/SK/ 227/82 corrected up to 30.06.86 and 228/82 corrected up to 18.01.83.The key & handle should be at rate of one each per 4 Junction boxes.	No.	4260
367	Supply of calling on signal unit with lenses, lamps and offset bracket 3.5"dia without signal transformer.	No.	2609
367 (a)	Supply of calling on signal unit with offset bracket 3.5"dia without lenses, lamps and signal transformer.	No.	2201
368	Supply of relay , Non-AC Immune, plug-in type, Style 'QN1' DC Neutral line, 24 V, 8F.8B contact, front and back contacts metal to carbon with plug board, retaining clip and connectors confirming to BRS:930,IRS:S 34 & IRS:S23 (as applicable). The interlocking code for this unit shall be ABCDF.	No.	3390
369	Supply of relay , Non-AC Immune, plug-in type, Style 'QN1' DC Neutral line, 24 V, 12F.4B contact at, front and back contacts metal to carbon with plug board, retaining clip and connectors confirming to BRS:930,IRS:S 34 & IRS:S23 (as applicable). The interlocking code for this unit shall be ABCDE	No.	2829
370	Supply of relay , AC Immune, plug-in type, Style 'QNA1' DC Neutral line, 24 V, 8F.8B contact, front and back contacts metal to carbon with plug board,	No.	2664

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	retaining clip and connectors confirming to BRS:931A, IRS:S 60 , IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be ABDGH		
371	Supply of relay , AC Immune, plug-in type, Style 'QNA1' DC Neutral line, 24 V, 12F.4B contact, front and back contacts metal to carbon with plug board, retaining clip and connectors confirming to BRS:931A, IRS:S 60 , IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be ABDFH	No.	2664
372	Supply of relay , AC Immune, plug-in type, Style 'QSPA1' DC Neutral line, slow to pickup, 24 V, 8F.4B contact, front and back contacts metal to carbon, complete with plug board, retaining clip and connectors confirming to BRS:933A, IRS:S 60, IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be ABDEJ	No.	3694
373	Supply of relay , AC Immune, plug-in type, Style 'QTA2' DC Neutral track,9 ohm ,2F.1B contact, front and back contacts metal to carbon, complete with plug board, retaining clip and connectors confirming to BRS:939A, BRS:966 (Appendix F2), , IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be FGHKX	No.	2610
374	Supply of relay , plug-in type, Style 'QL1'magnetically latched, neutral line,24 V DC , 11F.4B contact, front and back contacts metal to carbon, complete with plug board, retaining clip and connectors confirming to BRS:935A, IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be ABDEG	No.	5512
375	Supply of relay AC Immune plug-in type, Style 'QBCA1' DC biased point contactor,24 V , 2F(HD).4B contact, front contacts (heavy duty) and back contacts metal to carbon, complete with plug board, retaining clip and connectors confirming to BRS:943, IRS:S 34 & IRS:S 23 (as applicable). The interlocking code for this unit shall be BCEJK	No.	5523
376	Supply of Low maintenance lead acid stationary secondary cell as per IRS-S: 88/2004 including latest amendment, nominal voltage 2 V, each of 80 AH with hard rubber container for use of railway signalling and telecommunication application.	No.	2151
377	Supply of track feed battery charger to work on 110 V AC for charging 1 or 2 or 3 or 4 lead acid cell of 40/80 AH used in track circuit as per RDSO Specification No. IRS-S-89/93 with amendment No. 1 or latest.	No.	1613
378	Supply of Earth pipe complete along with eyelet as per	No.	1432

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	drawing No. RE/S&T/SIG /TENDER/SK /398/94 Alt (A)		
379	Installation of Earth Electrode including MS flat for Clamp etc. Signalling Equipments as lever frames, apparatus cases, signal, Relay Rack, Block Instrument etc. as per item 10(IV) & V) of Technical Specification of Enclosure-I.	No.	3587
380	Supply of electric point detector [as per RDSO Drg. No. SA 23331/32/33(Adv)] as per item 5 of technical specification of enclosure I.	No.	9758
380 (a)	Fixing of electric point detector on wooden sleeper and its wiring, testing and adjustment as per item 5 of technical specification of enclosure I.	No.	9197
380 (b)	Fixing of electric point detector on A-type foundation and its wiring, testing and adjustment as per item 5 of technical specification of enclosure I. This includes supply of A-type foundation, concrete and all required material except Electric point detector.	No.	13644
381	Supply of wire insulator for wire operating level crossing, lifting barriers/signals as per specification no. IRS-S-47-74.	No.	467
381 (a)	Installation of wire insulator for wire operating level crossing, lifting barriers/ signals as per specification no. IRS-S-47-74.	No.	1634
382	Supply of insulator for point rodding complete (both steel & nylon portion) as per item no. 5(VIII) of technical specification of enclosure I.	Set	593
382 (a)	Installation of insulator of point rodding at function end and lever end as per item no. 5(VIII) of technical specification of enclosure I.	No.	1296
383	Supply of Rotary Key Transmitter suitable for RE area as per drg.no.SA22601 (Alt 4) or latest.	Pair	11364
383 (a)	Installation and commissioning of Rotary Key Transmitter suitable for RE area as per drg.no.SA22601 /M for siding point/LC Gate as per circuit diagram. This includes supply of all materials for installation of RKT as per item 5(VI) of technical specification of enclosure I.	Pair	6083
384	Supply of B Type Choke for track circuit as per specification No. IRS:S-65/83 Amed.3 or latest.	No.	1964
384 (a)	Supply and installation of Track circuit equipment including provision of Block joint for Berthing track with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with	No.	16245

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	longer nuts & bolts but will be installed by the contractor.		
385	Supply and installation of Track circuit equipment excluding Glued joint or Block joint for Berthing track circuit with TLJB (FRP Type),facing point to advance signal/Home signal/BSLB/SLB etc. as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	8992
385 (a)	Supply and installation of Track circuit equipment including Block joint for Berthing track with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	19020
385 (b)	Supply and installation of Track circuit equipment excluding Glued joint or Block joint for Berthing track circuit, facing point to advance signal/Home signal/BSLB/SLB with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	11767
386	Supply and installation of Track circuit equipment including provision of Block joint for 2 Rail Length track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	10766
386 (a)	Supply and installation of Track circuit equipment excluding provision of Block joint for 2Rail Length track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	8076
386	Supply and installation of Track circuit equipment	No.	13541

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(b)	including provision of Block joint for 2 Rail Length track circuit with TLJB (Cast iron Type)as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.		
386 (c)	Supply and installation of Track circuit equipment excluding provision of Block joint for 2 Rail Length track circuit with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	10851
387	Supply and installation of Track circuit equipment including provision of Block joint for Single end point track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	17725
387 (a)	Supply and installation of Track circuit equipment excluding provision of Block joint for single end point track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	12345
387 (b)	Supply and installation of Track circuit equipment including provision of Block joint for single end point track circuit with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No	20500
387 (c)	Supply and installation of Track circuit equipment excluding provision of Block joint for single end point track circuit with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the	No	15120

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	contractor.		
388	Supply and installation of Track circuit equipment including provision of Block joint for Double ended point track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No	20658
388 (a)	Supply and installation of Track circuit equipment excluding provision of Block joint for Double ended point track circuit with TLJB (FRP Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No	13932
388 (b)	Supply and installation of Track circuit equipment including provision of Block joint for Double ended point track circuit with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No	23433
388 (c)	Supply and installation of Track circuit equipment excluding provision of Block joint for Double ended point track circuit with TLJB (Cast iron Type) as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	16707
389	Supply and installation of Track circuit equipment excluding Glued joint or block joint, track lead junction box, bond wire for modification of existing track circuit as per item 6 of technical specification of Enclosure I. This does not include supply of Track feed charger, Relays, Cable, secondary cells, B type choke, Machine fishplate with longer nuts & bolts but will be installed by the contractor.	No.	6317

CHAPTER - IV

2	3	4	5
401	Manufacture, supply and installation of composite Relay rack complete with fuse bases and fuses etc. fixing of ARA Terminals, relays etc. as per item 7(I),(II) & (IV) of Technical Specification of Enclosure-I.	No.	67853
401 (a)	Manufacture, supply and installation of composite Relay Rack complete as per drawing No. CORE/S&T/ALD/SK/504/ 2001 with fuse bases and fuses etc. Fixing of ARA Terminals, Relays etc. as per item 21 of Technical Specification of Enclosure-I.	No.	59811
401 (b)	Manufacture, supply and installation of prewired Relay Rack as per drawing No. CORE/ S&T /ALD/SK/597/2013. Fixing of Relays, Point Group etc. as per item 21 of Technical Specification of Enclosure-I.	No.	53353
401 (c)	Manufacture, supply and installation of cable Termination Board with fuse bases, fuses etc. as per drawing No. CORE/S&T/ ALD/SK/ 505/ 2001. Fixing of ARA Terminals etc. as per item 21 of Technical Specification of Enclosure-I.	No.	45030
402	Supply and installation of high voltage cum signal cable termination rack and fixing of high voltage signal Transformers, switches and termination of cable on Rack as per item 7(V) of Technical Specification of Enclosure-I.	No.	29621
403	Spare		
404 (a)	Interconnection wiring with ladder arrangement for Relays, Power supply equipment, Lever locks, CB terminals/Fuses, Luminous indicator from /to Relay Room to Equipment Room/ASM Room/Battery Room, DG Room and Rack to rack and Composite relay rack and HV rack for MACLS based on approved signalling plans and circuit diagrams as per item 7(III) of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	73404
404 (b)		Med. Stn 4 Lines	86039
404 (c)		Big Stn. 5-6 Lines	121213
404 (d)		Big Stn. 7-9 Lines	158840
404 (e)		Big Stn. 10-12 Lines	204535
404 (f)		Big Stn. 13-15 Lines	260348
404 (g)		LC Gate	49025
405 (a)	Interconnection wiring with ladder arrangement	Small Stn. 2-3 Lines	90169

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405 (b)	wherever required for control panel Relay Room equipment & Power supply equipment, Battery Room, ASM Room, Outdoor equipment termination in Relay room, Equipment terminals, CT Rack and HV rack and rack to rack wiring etc. for panel interlocked station based on approved signalling plans and circuit diagrams as per item 7(III) of Technical Specification of Enclosure-I.	Med. Stn 4 Lines	106992
405 (c)		Big Stn. 5-6 Lines	158272
405 (d)		Big Stn. 7-9 Lines	186697
405 (e)		Big Stn. 10-12 Lines	248420
405 (f)		Big Stn. 13-15 Lines	305540
405 (g)	Interconnection wiring with ladder arrangement where ever required for control panel, Relay Room equipment & Power supply equipment, Battery Room, ASM Room, Outdoor equipment termination in Relay room, Equipment terminals, CT Rack, HV rack, and rack to rack wiring etc. for panel interlocking station based on approved signalling plans and circuit diagrams as per item 7(iii) of technical specification of Enclosure I. **This does not include supply of 40C, 60C indoor Signalling cable.**	Small Stn. 2-3 Lines	46704
405 (h)		Med. Stn 4 Lines	54834
405 (i)		Big Stn. 5-6 Lines	80589
405 (j)		Big Stn. 7-9 Lines	153425
405 (k)		Big Stn. 10-12 Lines	194501
405 (l)		Big Stn. 13-15 ines	225881
406 (a)	Modification to existing MACLS station for interconnection wiring with ladder arrangement for Relays, Power supply equipment, Lever locks, CB terminals/Fuses, Luminous indicator from /to Relay Room to Equipment Room/ASM Room/Battery Room, DG Room and Rack to rack Composite relay rack and HV rack if required based on approved signalling plans and circuit diagrams as per item 7(III) of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	50345
406 (b)		Med. Stn 4 Lines	74671
406 (c)		Big Stn. 5-6 Lines	101727
406 (d)		Big Stn. 7-9 Lines	143816
406 (e)		Big Stn. 10-12 Lines	201345
406 (f)		Big Stn. 13-15 Lines	251140
407 (a)	Modification to existing panel interlocked MACLS station for interconnection wiring with ladder arrangement where ever required for control panel, Relay Room equipment & Power supply equipment, Battery Room, ASM Room, Outdoor equipment, termination in Relay room, Equipment terminals, CT Rack HV rack (if required) and rack to rack wiring etc. based on approved signalling plans and circuit diagrams as per item 7(III) of Technical Specification of Enclosure-I.	Small Stn. 2-3 Lines	67208
407 (b)		Med. Stn 4 Lines	72015
407 (c)		Big Stn. 5-6 Lines	107155
407 (d)		Big Stn. 7-9 Lines	173080
407 (e)		Big Stn. 10-12 Lines	224685
407 (f)		Big Stn. 13-15 Lines	268182
408	Modification to existing MACLS interlocked LC gate for interconnection wiring between Relays, power room, battery	LC gate	28166

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	room/location boxes and HV rack etc. based on approved signalling plans and wiring diagrams as per item 7(III) of Technical Specification of Enclosure-I.		
409	Removal of D/W clutch lever from the lever frame and providing miniature levers with plunger on the existing lever frame. Miniature lever & plunger will be supplied by Railway.	Cabin consisting of 14 levers	32722
410	Supply and Installation of 4 way circuit controller to modified design according to the type of lever frame and item 8 (V) of Technical Specification of Enclosure-I.	No.	3560
411	Supply and Installation of 6 way circuit controller to modified design according to the type of lever frame and item 8 (V) of Technical Specification of Enclosure-I.	No.	3740
412	Supply and Installation of 8 way circuit controller to modified design according to the type of lever frame and item 8 (V) of Technical Specification of Enclosure-I.	No.	3860
413	Supply and Installation of Lever lock as per item 8 (V) of Technical Specification of Enclosure-I.	No.	10645
414	Supply and fixing of terminal strips, Hylam strips for SM's slide frame and wiring and testing of SM's slide control frame as per item 8 of Technical Specification of Enclosure-I.	No.	5593
415	Supply and Installation of wooden shelves for the lever frame as per item 8 of Technical Specification of Enclosure-I.	Shelves	14594
416	Supply and Installation of luminous indicator for the lever frame as per item 8 of Technical Specification of Enclosure-I.	Indicator	723
417	Supply and Installation of shelves for the SM's slide frame as per item 8 of Technical Specification of Enclosure-I.	Shelves	4766
418	Supply and Installation of luminous indicator for the SM's slide frame as per item 8 of Technical Specification of Enclosure-I.	Indicator	723
419	Supply of Double pole MCB 5 Amp in Relay Room & Apparatus case. Suitable boxes for housing them also to be supplied.	No.	295
420	'Manufacture, wiring, supply & installation of operating cum indication panel domino type as per RDSO Specn. No. RDSO/ SPN/186/2004 Revision 2.0 with latest amendment on the basis of approved interlocking plan. The size of panel should be such as to accommodate additional one line on either side for future expansion. The contractor shall also indicate the size of the panel for the following panel stations:- -------. (For 2/3/4 lines stations). NOTE:- This includes provision of Tag Blocks with unbreakable transparent cover as per IRS: S 77 (with latest amendment) in place of Connectors as per clause 3.9.2 of RDSO Specn. No. RDSO/SPN/186/2004 Revision 2.0 (with latest amendment), if required by Railway.	Station	150521
421	Modification of existing block instrument / token instrument/ tokenless instrument to suit 25kv AC traction area as per standard circuit diagram to be supplied by Railway. Block bell	One Pair of Block Instrument	22220

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	equipment, filter unit & polarized relay/relays shall be supplied by Railway and all other materials, condensers, resistances etc. required for the work shall be supplied by contractor. This includes wiring of battery charger and secondary cells connected to block instruments. Cost of supply of secondary cells shall not be included in this item as it is Railway supply item.		
422	Replacement of existing single line Tokenless block instrument. Installation and wiring, commissioning & testing of new Daido type Single line Instrument to suit 25kv AC traction area as per standard circuit diagram to be supplied by Railway. Block bell equipment, filter unit & polarized relay/relays, battery charger and secondary cells shall be supplied by Railway and all other materials, Condensers, Resistors, etc. required for the work shall be supplied by contractor.	One Pair of Block Instrument	25486
423	Installation and wiring of power supply equipment, complete with battery, Battery chargers, transformers, ICDP switches, power off relays, stabilizers etc as per typical power supply distribution plan enclosed to the tender paper & item 9 of Technical Specification of Enclosure-I for MACLS stations.	Equipment Room	29092
424	Installation and wiring of Additional power supply equipment, in connection with modification of existing power supply arrangement.	Equipment Room	30182
425	Supply of Battery rack Sal wood as per drawing No. SK/DRG/OL/102	No.	7879
426	Supply of ICDP Switches 16 Amp Havel's make or similar with wooden Board.	No.	530
427	Manufacturing, supply and fixing of equipment rack of Sal wood supported by MS angle to accommodate additional power supply equipments in connection with RE modification as per item 9 (IV) of Technical Specification of Enclosure-I.	Equipment Room	21857
428	Installation of D.G. set(7.5 KVA) for standby supply with remote operation facility from the ASM room as per item 9(VI) to 9(X) of Technical Specification of Enclosure-I.	No.	39419
429	Charging of Secondary cells as per item 9(III) of Technical Specification of Enclosure-I.	No.	565
430	Installation of 2 Detection Axle Counter suitable for RE area as per specification no.IRS-S-42 with Electronic jn. Box, Evaluator, Track device, resetting box, DC-DC converter and all associated materials /equipment for the work.	One set of Axle Counter	46308
430 (a)	Installation of Track Detection unit (each track detection unit comprises of 2 sets of track devices assembly of transmitter/ receiver) and electronic Junction box. Fabricating apparatus case for providing shelves, Terminal boards etc. and wiring the equipment in conformity to RDSO Drg. No. SDO/UAC 325 & 326. Adjusting & Testing as per Item 15 of Technical Specification of Enclosure-I.	Set.	38065
430	Installation of 2 detection universal Axle Counter for track	No.	40937

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(b)	circuiting consisting of evaluator, Resetting box, Line verification box & utilizing track detection unit (Installed against separate item) and subsequently testing and commissioning of system as per item 16 of Technical Specification of Enclosure-I.		
430 (c)	Installation of 3/4 detection universal Axle Counter for track circuiting consisting of evaluator, Resetting box, Line verification box & utilizing track detection unit (Installed against separate item) and subsequently testing and commissioning of system as per item 16 of Technical Specification of Enclosure-I.	No.	40937
430 (d)	Installation of 2 detection universal Axle Counter for double line block working consisting of evaluator, Resetting box & utilizing track detection unit (Installed against separate item) as per item 16 of Technical Specification of Enclosure-I.	No.	52675
430 (e)	Supply of Single Section Digital Axle Counter (SSDAC): Supply of high frequency digital axle counter consisting of single section type system including two sets of detection points with double rail contact, with integral cable, mounting accessories, track side electronic units, deflectors on both sides of rail contact, reset box, final vital relay & mushroom cover for housing of way side electronics at both end of SSDAC application. Single Section Digital Axle Counter (SSDAC) will be Phase Reversal Type as per RDSO Specn. No .RDSO / SPN/177/2005 (Ver.2) with Amnd.1 or latest and consisting following:- a) High Frequency TX Coil & RX Coil (21 KHz & 23 KHz) -2 Sets and each Set will consist Wave Mounting Type TX Coil - 2 Nos. and RX Coil - 2 Nos. b) Track Side Digital Axle Counter Unit - 2 Nos. c) 24V.1000 Ohms, Q-Series Type Relay along with Relay Box duly wired- 4 Nos. d) Clamp with Deflector Plate & hardware etc. - 4 Nos. e) Reset Box -2 Nos. f) Surge voltage Protection Device - 2	Set	306576
430 (f)	Installation testing and commissioning of single section digital axle counter as supplied under item 430(e). Note: SSDAC will be installed, wired, tested and commissioned by OEM's engineer as per guidelines issued by RDSO. The pre commissioning checklist issued by RDSO for SSDAC will be prepared by OEM's engineer and signed jointly with Rly's Site Engineer. Before commissioning of SSDAC, OEM will submit Site Installation Certificate to Railway by mentioning that SSDAC has been installed, wired, tested and commissioned by approved vendor of RDSO i.e. by OEM	Set	30557
430 (g)	Complete indoor wiring/alteration in relay room in c/w	Set	37104

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	commissioning functioning of SSDAC for Block working. All material such as hylem strips for CT rack, cable supporting ladder duh insulated wherever required, lugs, cable dressing material for wiring, hard wood plank, HDPE pipe, PVC pipe, elbows, T joints, nuts and bolts etc if required for this purpose, will be supplied by the contractor. For axle counter installation, complete wiring will be done as per RDSO's guidelines. An, addition/ alteration required for commissioning of the system related with existing Block Instrument, relay room, power equipment room and operating cum indication panel etc will be done by the contractor with his own material and cost. This item is co-related with the Item 430(e) & 430(f). Note: SSDAC will be installed, wired, tested and commissioned by OEM's engineer as per guidelines issued by RDSO. The pre commissioning checklist issued by RDSO for SSDAC will be prepared by OEM's engineer and signed jointly with Rly's Site Engineer. Before commissioning of SSDAC, OEM will submit Site Installation Certificate to Railway by mentioning that SSDAC has been installed, wired, tested and commissioned by approved vendor of RDSO i.e. by OEM		
430 (h)	Supply of SSDAC Tool Kit. Each Set will consist of: a) Portable Data Analyzer (Downloading Event Logger Data for analysis and report generation) - 1 No. b) Pure Sine Wave Digital Multimeter Fluke Make (Model- 1871 or Rishab Make(Model-28S) - 1 No. c) Train Simulator Mode11TS267P) - 1 No. d) Extender Card - I No. e) Dummv Wheel- 1 No. f) Ring Spanner(17-19, 24-26)- I No. each g) Open End Spanner (17-19, 24-26) - 1 No. each h) Socket Spanner with Handle - 1 No. i) Torque Wrench (Jaicom JPR 65 or equivalent. 88 NM) 1 No.. j) Screw Driver no.902 - 1 No. k) Screw Driver no.935 - 1 No. l) Marking Jig for drilling as applicable m) Dummy Load to check Power Supply (Resistive) 1 No.	Set	122294
431	Supply and laying of HDPE pipe 32 mm dia. & 5 mm thick for electronic Junction box to track device.	Mtr.	581
432	Supply and Installation of magneto telephone with all accessories (stand box & 3 no. of 6 I cells.)	No.	7856

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433	Supply and installation of Cabin Diagram Board with white sunmica top having aluminum angle on all 4 sides duly painted for station working rule diagram in cabin /ASM Office as per item 10 (III) of Technical Specification of Enclosure-I.	No.	6126
434	Supply and installation of illuminated indication Diagram Board with white sunmica top having aluminum angle on all 4 sides duly painted for station working rule diagram in cabin /ASM Office as per item 10(VI) of Technical Specification of Enclosure-I.	Station	12399
435	Supply and installation of illuminated indication Diagram Board with white sunmica top having aluminum angle on all 4 sides duly painted for station working rule diagram in Level Crossing as per item 10(VI) of Technical Specification of Enclosure-I.	LC gate	5264
436	Installation of D.G. set (7.5 KVA) for standby supply with remote operation facility from the ASM office on anti vibration cushy foot mountings as per item 9(VI) to 9(X) of Technical Specification of Enclosure-I. Dunlop metalistic cushy foot anti vibrator mounting series(A) shall be supplied by the contractor as per drg. no. CORE/S&T/ALD/SK/375/93.	No.	34934
437	Installation and wiring of power supply equipment, complete with battery, Battery chargers, transformers, ICDP switches, power off relays, stabilizers, inverters etc as per typical power supply distribution plan enclosed to the tender paper & item 9 of Technical Specification of Enclosure-I for MACLS end cabin.	Equipment Room	31989
438	Installation and wiring of power supply equipment, complete with battery, Battery chargers, transformers, ICDP switches, power off relays, stabilizers, inverters etc as per Railway practice & item 9 of Technical Specification of Enclosure-I for central panel with MACLS station.]	Equipment Room	47245
439	Installation and wiring of inverter in equipment room, with battery, Battery chargers and connections to equipment as per typical power supply distribution plan enclosed to the tender paper and item 9 of Technical Specification of Enclosure-I.	Equipment Room	12512
439 (a)	Installation, wiring, testing and commissioning of SMPS based Integrated Power Supply for station up to 4 lines . This includes provision of required all cables from IPS room to relay room as per specification no. IRS:S 76-89/IS 694 of grading 1100 V, ladder supporting arrangement for wiring , dressing, lacing and bunching	No.	87173

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	etc. from IPS room to relay room as per item 19 of technical specifications of enclosure-I. (Note: Installation and charging of batteries and supply of exhaust fan will be made by IPS supplier. Fixing arrangement for Exhaust fan including provision of hole in the wall, if not available will be done by contractor.)		
439 (b)	Installation, wiring, testing and commissioning of SMPS based Integrated Power Supply for station 5 to 6 lines . This includes provision of required all cables from IPS room to relay room as per specification no. IRS:S 76-89/IS 694 of grading 1100 V, ladder supporting arrangement for wiring , dressing, lacing and bunching etc. from IPS room to relay room as per item 19 of technical specifications of enclosure-I. (Note: Installation and charging of batteries and supply of exhaust fan will be made by IPS supplier. Fixing arrangement for Exhaust fan including provision of hole in the wall, if not available will be done by contractor.)	No.	105280
439 (c)	Installation, wiring, testing and commissioning of SMPS based Integrated Power Supply for LC Gate. This includes provision of required all cables from IPS room to relay room as per specification no. IRS:S 76-89/IS 694 of grading 1100 V, ladder supporting arrangement for wiring , dressing, lacing and bunching etc. from IPS room to relay room as per item 19 of technical specifications of enclosure-I. (Note: Installation and charging of batteries and supply of exhaust fan will be made by IPS supplier. Fixing arrangement for Exhaust fan including provision of hole in the wall, if not available will be done by contractor.)	No.	54491
440 (a)	Supply of Data Logger system make for S&T installation as per RDSO specification no. IRS-S-99/2006 with latest amendment digital input 512 and analog 32.	No.	251850
440 (b)	Installation of data logger as per RDSO specification no. IRS-S-99/2006 or with latest amendment along with supply of wire & wiring from intermediate tag block to the data logger.	No.	37375
440 (c)	Supply of: (a) Multiport front end processor with central monitoring unit for Railway S&T installation as per RDSO specification no. IRS-S-99/2006 with latest amendment with 8 ports networking and dual card lease lines 4 Nos. compatible to interface with EI/SSI (b) Failure Analysis system with Intel mother board with	No.	263350

2	3	4	5
	(three year onsite warranty) fitted with V pro configuration, Core 2Duo 8400, 3 GHz, 6 MB L 2 cache and 1333 MHz FSB, 2GB, 667 MHz DDR2 RAM expandable to 8 GB , 250 GB, 7200 rpm HCD, 17 " TFT Digital colored monitor, 104 keys board , optical mouse , 6 USB ports at least two in front , DVD writer 8X or better , 10/100/1000 on board integrated network ports with remote booting facilities, Window 7 operating system with MS Office 2010 and Norton fee antivirus (c) Protocol Converter for Railway S&T installation as per RDSO specification no. IRS-S-99/2006 with latest amendment.		
440 (d)	Installation, testing & commissioning of front end processor, failure analysis system and protocol converter.	No.	21850
441	Supply of block filter unit used in 25 KV AC in RE area as per RDSO Spec. no. IRS: S-68/89 or latest and Block Bell Equipment as per RDSO Spec. No. IRS:TC-44/88 or latest.	No.	16604
442	Supply of Indoor signalling cable 40 Corex0.6 mm as per IRS:S 76/89 (with latest amendment) & as per item 7(III) of technical specification of Enclosure I.	Meter	110.67
443	Supply of Indoor signalling cable 60 Corex0.6 mm as per IRS:S 76/89 (with latest amendment) & as per item 7(III) of technical specification of Enclosure I.	Meter	163.03
444	Supply of Indoor signalling cable 40 Corex1 mm as per IRS:S 76/89 (with latest amendment) & as per item 7(III) of technical specification of Enclosure I.	Meter	272.51
445	Supply of Indoor signalling cable 60 Corex1 mm as per IRS:S 76/89 (with latest amendment) & as per item 7(III) of technical specification of Enclosure I.	Meter	405.79

CHAPTER - V

1	2	3	4
501	Carrying out Locking addition/ alteration in mechanical lever frame for 10 to 24 lever frame to suit interlocking plan, Locking table & Dog chart. Testing & overhauling will be done as per Item 8 (IV) of Technical Specification	No.	56679

1	2	3	4
	of Enclosure-I.		
502	Carrying out Locking addition/ Alteration in mechanical lever frame for 25 to 50 lever frame to suit interlocking plan, Locking table & Dog chart. Testing & overhauling will be done as per Item 8 (IV) of Technical Specification of Enclosure-I.	No.	91950
503	Carrying out Locking addition/ Alteration in mechanical lever frame for above 50 lever frame to suit interlocking plan, Locking table & Dog chart. Testing & overhauling will be done as per Item- 8 (IV) of Technical Specification of Enclosure-I.	No.	148801

CHAPTER - VI

1	2	3	4
601 (a)	Testing & commissioning of MACLS installation as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor, artisan staff/ labours and testing of equipment shall be provided by the contractor & testing shall be carried out to ensure compliance of SEM, RE manual, G & SR, Block Working Manual & adherence to specification of the tenders both for the outdoor works & indoor works.	Small Stn. 2-3 Lines	90275
601 (b)		Med. Stn 4 Lines	142898
601 (c)		Big Stn. 5-6 Lines	203173
602	Testing & commissioning of MACLS installation as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor, artisan staff/ labours and testing of equipment shall be provided by the contractor & testing shall be carried out to ensure compliance of SEM, RE manual, G & SR, Block Working Manual & adherence to specification of the tenders both for the outdoor works & indoor works.	LC.Gate	24191
603 (a)	Testing & commissioning of PI with MACLS installation as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor for indoor & outdoor work .All artisan staff/ labours required for testing and commissioning of PI with MACLS work shall be provided by the contractor for indoor and outdoor work. Testing equipment such as multimeter, track circuit equipment, track circuit simulation panel, signal and point operation simulation arrangement etc. shall be provided by the contractor for outdoor/indoor at his own cost. Testing shall be carried out to ensure compliance of SEM, RE manual, G & SR,	Small Stn. 2-3 Lines	110038
603 (b)		Med. Stn 4 Lines	155627
603 (c)		Big Stn. 5-6 Lines	219201

1	2	3	4
	Block Working Manual & adherence to specification of the tenders.		
604 (a)	Testing & commissioning of existing MACLS installation along with additional alteration carried out in connection with RE modification on a whole shall be carried out by the engineer in charge of work with the help of representative of contractor for indoor & outdoor work. All artisan staff/ labours required for testing and commissioning of existing panel /MACLS installation shall be provided by the contractor for indoor and outdoor work. Testing equipment such as multimeter, track circuit equipment, track circuit simulation panel, Signal & point operation simulation arrangement etc. shall be provided by the contractor for outdoor at his own cost. Testing shall be carried out to ensure compliance of SEM, RE Manual, General & Subsidiary rules, Block Working manual & adherence to specification of tenders.	Small Stn. 2-3 Lines	101623
604 (b)		Med. Stn 4 Lines	128917
604 (c)		Big Stn. 5-6 Lines	178455
605	Testing & commissioning of existing MACLS installation along with additional alteration carried out in connection with RE modification as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor for indoor & outdoor work. All artisan staff/ labours required for testing and commissioning of existing panel /MACLS installation shall be provided by the contractor for indoor and outdoor work. Testing equipment such as multimeter, track circuit equipment, track circuit simulation panel, Signal & point operation simulation arrangement etc. shall be provided by the contractor for indoor/outdoor at his own cost. Testing shall be carried out to ensure compliance of SEM, RE Manual, General & Subsidiary rules, Block Working manual & adherence to specification of tenders.	LC.Gate	20252
606 (a)	Testing & commissioning of MACLS installation along with additional alteration carried out in connection with RE Modification as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor. Artisan staff/ labours and testing of equipment shall be provided by the contractor & testing shall be carried out to ensure compliance of SEM, RE manual, G & SR, Block Working Manual & adherence to specification of the tenders both for the	Spl. Stn. 7-9 Lines	227103
606 (b)		Spl. Stn. 10-12 Lines	314814
606 (c)		Spl. Stn. 13-15 Lines	446386

1	2	3	4
	outdoor works & indoor works		
607 (a)	Testing & commissioning of PI with MACLS installation as a whole shall be carried out by the engineer in charge of work with the help of representative of contractor for indoor & outdoor work. All artisan staff/ labours required for testing and commissioning of PI with MACLS work shall be provided by the contractor for indoor and outdoor work. Testing equipment such as multimeter, track circuit equipment, track circuit simulation panel, signal and point operation simulation arrangement etc. shall be provided by the contractor for outdoor/indoor at his own cost. Testing shall be carried out to ensure compliance of SEM, RE manual, General & Subsidiary Rules, Block Working Manual & adherence to specification of the tenders for both indoor & out door works.	Spl. Stn. 7-9 Lines	285685
607 (b)		Spl. Stn. 10-12 Lines	413416
607 (c)		Spl. Stn. 13-15 Lines	512919
608 (a)	Testing & commissioning of existing Panel/ MACLS installation along with additional alteration carried out in connection with RE modification on a whole shall be carried out by the engineer in charge of work with the help of representative of contractor for indoor & outdoor work. All artisan staff/ labours required for testing and commissioning of existing panel /MACLS installation shall be provided by the contractor for indoor and outdoor works. Testing equipment such as multimeter, track circuit equipment, track circuit simulation panel, Signal & point operation simulation arrangement etc. shall be provided by the contractor for outdoor/indoor work at his own cost. Testing shall be carried out to ensure compliance of SEM, RE Manual, General & Subsidiary rules, Block Working manual & adherence to specification of tenders.	Spl. Stn. 7-9 Lines	239682
608 (b)		Spl. Stn. 10-12 Lines	342913
608 (c)		Spl. Stn. 13-15 Lines	426088

CHAPTER - VII

1	2	3	4
701 (a)	Releasing of Mechanical Signals with fittings, wire transmissions, Mechanical detectors, Signal/Point mechanism and other ground gears, Signal arms, Reversers, wire lever frame with all fittings and post for over head alignments etc. as per Item 11 (a)&(b) of Technical Specification of Enclosure-I for panel	Small Stn. 2-3 Lines	77676
701 (b)		Med. Stn 4 Lines	105832
701 (c)		Big Stn. 5-6 Lines	121556

1	2	3	4
701 (d)	interlocking station.	Big Stn. 7-9 Lines	180184
701 (e)		Big Stn. 10-12 Lines	240394
701 (f)		Big Stn. 13-15 Lines	306234
702 (a)	Releasing of Mechanical Signals with fittings, wire transmissions, Mechanical detectors, Signal/Point mechanism and other ground gears, Signal arms, Reversers, wire and post for over head alignments etc. as per Item 11 (a)&(b) of Technical Specification of Enclosure-I for MACLS station.	Small Stn. 2-3 Lines	73858
702 (b)		Med. Stn 4 Lines	82368
702 (c)		Big Stn. 5-6 Lines	106406
702 (d)		Big Stn. 7-9 Lines	127345
702 (e)		Big Stn. 10-12 Lines	156573
702 (f)		Big Stn. 13-15 Lines	223014
703	Releasing of Mechanical Signals with fittings, wire transmissions, Mechanical detectors, Signal/Point mechanism and other ground gears, Signal arms, Reversers, wire and post for over head alignments etc. as per Item 11 (a)&(b) of Technical Specification of Enclosure-I, for level crossing gate.	L.C. Gate.	26950
704 (a)	Transporting of released materials except signal post & post of over head alignment **to ---------- scrap yard depot** & staking properly as per instructions of Engineers representative.	Small Stn. 2-3 Lines	33866
704 (b)		Med. Stn 4 Lines	45154
704 (c)		Big Stn. 5-6 Lines	56443
704 (d)		Big Stn. 7-9 Lines	67734
704 (e)		Big Stn. 10-12 Lines	79020
704 (f)		Big Stn. 13-15 Lines	90308
705	Transporting of released materials except signal post & post of over head alignment **to ---------- scrap yard depot** & staking properly as per instructions of Engineers representative	L.C Gate	11289
706 (a)	Loading of Signal post & post of over head alignment in Railway wagon at station as per instructions of Engineers representative for booking by the Railways.	Small Stn. 2-3 Lines	24605
706		Med. Stn	34204

1	2	3	4
(b)		4 Lines	
706 (c)		Big Stn. 5-6 Lines	41460
706 (d)		Big Stn. 7-9 Lines	65409
706 (e)		Big Stn. 10-12 Lines	79666
706 (f)		Big Stn. 13-15 Lines	114799
707	Loading of Signal post & post of over head alignment in Railway wagon at station as per instructions of Engineers representative for booking by the Railways	LC Gate	9014
708 (a)	Loading and transportation of Signal post & post of over head alignment by contractor truck **to ---------- scrap yard depot** & staking properly as per instructions of Engineers representative	Small Stn. 2-3 Lines	33870
708 (b)		Med. Stn 4 Lines	43469
708 (c)		Big Stn. 5-6 Lines	50725
708 (d)		Big Stn. 7-9 Lines	83938
708 (e)		Big Stn. 10-12 Lines	98196
708 (f)		Big Stn. 13-15 Lines	133329
709	Loading and transportation of Signal post & post of over head alignment by contractor truck **to ---------- scrap yard depot** & staking properly as per instructions of Engineers representative	LC Gate	18279
710 (a)	Transportation of signalling materials by road as per the instructions of the railway representative at site. The work also includes loading and unloading of the materials. Transportation upto 100 Kms.	Per Ton Km	12.30
710 (b)	Transportation of signalling materials by road as per the instructions of the railway representative at site. The work also includes loading and unloading of the materials. Transportation more than 100 Kms.	Per Ton Km	7.52

ENCLOSURE-I

TECHNICAL SPECIFICATIONS

ITEM 1. TRENCHING AND LAYING OF CABLE

(I) Schedule items regarding Trenching and laying of signaling cables and associated items will be executed as per RDSO guidelines issued vide their Document No. RDSO/SI/G/2010 Version1.1 with effective date from 04.02.2014 or latest along with various drawings mentioned therein except for the items specified below.

(II) Any defect noticed during the testing after laying the cable the same will be replaced by the contractor at his own cost.

(III)(a) Supply providing and concreting of cable markers (C.I. type) along the cable route shall as per Drg. No. CORE/S&T/ALD/SK/373/93 page10 Alt. 'A'. These will be provided as per schedule as advised by the site engineer.

The cable markers should be planted in such way that the top of the cable marker is on the ground level and shall be concreted with 300 mm x 200 mm x 200 mm.

(b) Supply, providing and fixing of cable marker (RCC type) along the cable Route shall be as per Drg. No. CORE/S&T/ALD/SK/600/2013. These will be provided as per schedule as advised by the site engineer.

(IV) Supply and laying of 150 mm dia. x 2 meter long RCC pipes with collars and 2 nos. 8 SWG G.I. wire inside the pipe below metal road or track or L- Xing as per drg. Nos. RE/S&T/SIG/TENDER/SK/28/85 and CORE/S&T/ALD/SK/ 373/93 page 11 and CORE/S&T/ALD/SK/373/93 page 12. The RCC pipe length shall be sufficient to cover complete the metal road or track or L-xing gate.

(V) Meggering & testing of all main and tail cables before and after laying of the cable in trenches and also after termination in apparatus cases, Jn. Boxes and relay room. Testing will be done jointly with railway representative and submission of joint cable, insulation chart certificate to Engineer In charge. The cable shall not be commissioned if the insulation resistance is found less than the standard value.

(VI) All the core of the cable (used or spare) should be terminated on ARA terminals/wago terminals in cabin/SM's office or apparatus cases. Each core so terminated will be provided with identification ferrules with letters or/numbers embossed on them as per requirement of circuitry.

(VII) Cable shall be laid in RCC Split pipe for a length of 300 mtr. on either side of the feeding /Traction sub stations. One number, 2 mtr. long RCC split pipe contains top & bottom portion of the pipe. Whenever, 2 meter long RCC split

pipe is not available/ feasible it can be achieved with 2 nos. of 1 mtr. long RCC split pipes also with specific approval of the Dy. CSTE /RE/Project.

(VIII) Laying of cable should be as per approved cable route plan. Before cable laying is permitted joint inspection of trench has to be carried out jointly by Railway and contractor's representative. Whenever the dimensions of cable trenches as mentioned in the tender document are not achievable fully due to certain condition then, payment will be made for the lesser dimension so achieved on pro-rata basis and decision of site engineer in this regard shall be final. The specific approval of the Dy.CSTE/RE/ Project of the work will be necessary for such locations. A Certificate (in the format given in Form-III of tender document) has to be jointly signed by Railway representative and contractor's representative duly approved by Dy.CSTE/RE/ Project and kept in record.

(IX) The basic purpose of placing bricks during cable laying is to cover entire length and to provide protection to laid cable without any gap between adjacent bricks. Standard size of bricks is approximately 225mmx100mmx75mm. In normal case, 8 - 9 standard size bricks may cover the entire one meter length but in some region, quantities of bricks per meter may vary due to non availability of standard size bricks in that region. Before commencement of the work, the number of bricks required to cover (without any gap) 1 meter length should be determined by officer in charge of the work and approval of Dy.CSTE in charge of the work should be obtained. In case of smaller width bricks, number of bricks per meter exceeds 9, payment shall be made @ 9 bricks per meter. Smaller size bricks where number of bricks per meter exceeds 10 should not be permitted.

Note: Wherever specific drg. is mentioned in the Schedule, the same drg. Shall be followed.

ITEM 2. CASTING OF FOUNDATION

(I) Casting of main signal foundation as per drawing no. RE/S&T/SIG/ Tender/SK /1/85.

(II) Casting of shunt signal foundation as per drg. no. RE/S&T/SIG/Tender /SK/2/85.

(III) Casting of single Apparatus cases foundation as per drawing no. RE/S&T/ SIG / Tender/ SK /9/85.

(IV) Casting of half apparatus case foundation as per drawing no. RE/S&T/Sig/ Tender/SK/8/85.

(V) Casting of jn. box foundation as per drawing No. RE/S&T/Sig/ Tender/ SK/ 5A/91.

(VI) Casting of SLB/BSLB/SB foundation as per drawing no. RE/S&T/Sig/ Tender /SK/10/85.

(VII) Casting of Diesel Generator (7.5 KVA) foundation as per drg. no. RE/S&T/ Sig/Tender/ SK/12/85.

(VIII) Casting of 'Ground Lever Frame' foundation as per drawing no. RE/S&T/ Sig / Tender /SK/3/85.

All the materials including cement for the above works shall be supplied by the contractor.

ITEM 3. APPARATUS CASES AND JUNCTION BOXES:

(I) Terminal strip of MS angle size 25mmX25mmX3mm for fixing of ARA terminals / wago terminals and fuses, hylam sheet of thickness as 12 mm and width 25 mm as per drg no. SK/DRG/OL/109 of SE railway shall be provided in apparatus cases, jn. boxes and relay room. Terminal and fuses should be fixed as per drg. No. CORE/S&T/ALD/SK/477/99, 480/99, 481/99, 482/99 484/99 & 485/99 & wired as per approved termination diagram and circuit diagram. Shelves in Apparatus cases shall be of 25 mm thick salwood.

(II) The location number is to be written /stenciled with letter of bold size of not less than 100 mm in block on both the doors. Power locations shall be indicated as 'PCT' with legend to read "DANGER 400 V" 230V as the case may be. It shall be stenciled in white letters in RED background on the door with 50 mm red band around the PCT.

The location with battery and battery chargers shall be stenciled with legend B.B. and B. C. respectively in 100 mm letters. Cable Termination arrangement in apparatus cases should be as per Drg. No. CORE/S&T/ ALD /SK/400/94 ALT.- A.

(III) The apparatus cases shall generally be on the same side of the track as the cable run and shall be placed just ahead of the signal, it serves so that aspect of the signal are seen while testing the location equipment.

(IV) TERMINAL BLOCK M-6 (ARA Terminal /wago terminals) shall be molded type and fuses non- deteriorating non - indicating type 2 Amp/3 Amp.

(V) Each core of every cable including spare cable core shall be terminated in the location boxes and shall be provided with identification ferrules with letters to indicate the designation of the circuit, which the particular core carried such as 12 DG or 15 NWKR etc.

(VI) Fixing of equipments such as high voltage signal transformer, MCB switches and all other equipments in apparatus cases of Schedule A (I) and (II) and

wiring of equipment as per wiring diagram. This item will be undertaken in case where 300 volts signal feed circuit is required.

Fixing of equipments such as relays etc. in apparatus cases of Schedule A (I) and (II) and wiring of equipment as per wiring diagram. All materials except ARA terminals / wago terminals and Rly. supply items mentioned in para (6) of volume I. for the above work shall be supplied by the contractor including but not limited to the following items:

(a) Terminal strips, Hylam Strips.
(b) Non - deteriorating type non indicating type and fuse base as per wiring diagram.
(c) Wiring, bunching and dressing materials.
(d) Salwood 25 mm thick shelves for shelter of equipments and batteries.
(e) Fixing arrangement for shelves, ARA terminals/wago terminals, fuses and relays etc.
(f) Fixing arrangement for MCB, High voltage signal transformers, etc. will be undertaken in case 300 volts signal feed circuit is required.

ITEM 4. SIGNAL EQUIPMENT:

(I) Fixing of CLS surface base bolting on the foundation, erection of CLS post with signal unit on to the top or on an offset bracket and fitting ladder & guard to the post at the top and concreting ladder base embedded into the ground and with supporting brackets in the middle, blanking of ladder for a distance of 1 ft. between the height of the 6'9" and 7'9" from the rail level by M.S. angle & M.S. Sheet of 0.6 mm thick wherever required and termination of cables. This includes provision of wooden (Sal) cross arm 1m x 1m for CLS unit prior to commissioning.

(II) Fixing of LED signals on CLS unit wiring the CLS unit and focusing the signal.

(III) Fixing of shunt signal surface base, bolting on to the foundation, erection of shunt signal post with signal unit, termination of cables. This includes provision of wooden (Sal) cross Arm 1m x 1m on signal unit prior to commissioning.

(IV) Fixing of LED shunt signals on shunt signal unit, wiring and focussing of signals.

(V) Fixing of route indicator on top of the signal post or on an off set bracket including fixing of offset bracket.

(VI) Fixing of LED signals, connecting cable, wiring and focussing of route indicator.

(VII) Elevation and distance of foundation from track shall be in accordance with the "schedule" of dimensions for Indian Railways published by Govt. of India and approved drawings.

All items for the above work except Rly. Supply items mentioned in volume - I (Annexure) shall be supplied by the contractor including but not limited to the following items:

(a) "U" bolt for offset brackets.
(b) Wooden cross Arms 1 x 1 mtr.
(c) M S Angle and M S sheet for blanking of ladders.
(d) Triple pole Lamps.

ITEM 5. POINT EQUIPMENT:

(I) Supply & fixing of electric point detector on sleeper and foundation as per drg. No.RE/S&T/SIG/Tender/SK/35/85 & Drg. No.RE/S&T/Sig/Tender/SK/34/85 respectively. Making rods of 32 mm after welding 32 mm solid joint one side and 32 mm threaded end joint as per Drg. No. RE/S&T/Sig /Tender/SK/33/85 on other side adjustment and preliminary testing, Casting concreting and curing of 'A' type foundation shall be as per drg. No. RE/S&T /Sig/Tender/SK/11/85. Connecting electric point detector after disconnecting the mechanical detectors, connection and wiring of tail cable of the detector and adjustment.

(II) Fixing of lock bar complete with fitting i.e. lock bar clip, lock bar stop, lock bar driving attachment, crank, compensator etc.
Note: - This item will be undertaken in case of Lock Bar/Holding Bar is required.

(III) Running of point rodding on trestle placed at 2 mtr. interval alongwith the provision of roller pin and split pin of lock bar/Hooding Bar/Facing point Lock/Siding Point. The trestle should be embedded in the earth fully on all side upto the top of the trestle. Casting, concreting and curing of foundation for 'A' & 'B' type foundation as per drg. No. RE/S&T/Sig/Tender/SK/11/85. Fixing of cranks, compensator on 'A' & 'B' type foundation and rodding should be connected with necessary solid joint wherever required with forged welding.

(IV) The facing point lock with switch extension piece and split stretcher bar shall be fixed inside the points as per standard drawings. FPL shall be fixed in level on the sleeper with proper size of bolts and nuts duly providing washers underneath the sleeper.

(V) All the materials except Point Rodding (Solid) including electric point detector, required for the above work shall be supplied by contractor including but not limited to the following items.

(a) Lock bar complete, Crank, compensator, Solid Joint 'A' & 'B' type foundation, screw joints, clips & stops.
(b) Guide roller assembly, trestle 1 way/ 2 way/ 3 way.

(VI) RKT shall be installed on a wooden board (Sal wood of 25 mm thick) complete with fixing arrangement/accessories as per approved circuit diagram and terminal board of RKT shall remain covered. All wiring materials for this including baton, board shall be supplied by contractor.

(VII) Installation of siding point with all fittings i.e. ground lever frame, FP lock along with hand plunger, point rodding, guide roller assembly, solid joint, cranks, compensators, casting, concreting and curing of foundation for 'A' & 'B' type foundation as per drg. no. RE/S&T/Sig/Tender/SK/11/85. Fixing of cranks and compensators on 'A' & 'B' type foundation and rodding should be connected with necessary solid joint wherever required with forged welding.

All the materials except point rodding (solid) required for the execution of above work shall be supplied by contractor including but not limited to the following items:

(a) Ground lever frames, F.P. lock with hand plunger.
(b) Guide roller assembly, trestles 1 way/2 way/3 way.
(c) Crank, compensator, solid joint A & B type foundation, screw joints etc.

(VIII) Removing of point rod from transmission, cutting the rod to proper length after making provision for insulation on point rodding and connecting in transmission maintaining its original length. This includes all smithy work and adjustment of point/lock bar for restoring normal working.
All materials including insulated Rod Joint required for above work shall be supplied by the contractor.

ITEM 6. TRACK CIRCUIT

(I) Track circuit shall be provided to conform to para 8 of IRS Specification IRS: S- 36/87.

(II) Bonding of rail joints which shall be made with 8 SWG G.I. soft solid wire, 7.2 mm holes are to be drilled close to fish plates on the web of rail and the bond wire are fixed by driving channel bond pin tightly as per Drg. No. CORE/S&T/ALD/SK/361/93. Two bond wires are to be provided for each joint in parallel. Bond clips are to be provided for each joint to keep the bond wire in tact. In point track circuit, parallel/polarity jumpers/bond wires/cables shall be provided as required by the Railway with proper supporting arrangements. Transverse bond shall also be provided for all track circuit as required by Railways.

(III) Track lead jn. boxes as required shall be fixed clear of infringement as indicated by Railway and the respective track circuit tail cable 2 x 2.5 sq. mm. PVC copper conductor from the apparatus case shall be terminated as per Drg. No. CORE/S&T/ALD/ SK/367/93.The connection from the TLD boxes to the rail should be through the solid GI soft wire 8 SWG wire which should be fixed to the rail at both feed and relay ends. The G.I. wire from TLD boxes to

sleepers should be covered with suitable PVC sleeves and thereupon neatly clipped on the sleepers to prevent shorting with rails, insulation bush shall be provided on TLD box to prevent G.I. wire earthing. TLDs shall be made of either FRP material / Cast Iron as mentioned in the schedule.

(IV) All TLD boxes shall be painted and track circuit number shall be neatly written as required by the Railway.

(V) Fixing of Insulated block joint complete with provision of skimmed fishplate in place of existing fishplate.

(VI) Provision of Insulation for block joint, gauge tie plate, switch extension bracket and William stretcher bar shall be made by the contractor.

(VII) Provision of 2 chokes 'B' type as per IRS specification No. IRS - S - 65/83 latest for track circuit and shall be fixed one at feed end and other at Relay end.

(VIII)

(a) Track circuit shall not be fed directly from AC supply using Transformer and rectifier. A storage battery 40/80 AH Capacity (2 or 3 or 4 nos.) must be connected with battery charger as per Drg. No. CORE/S&T/ALD/SK/363 /93 and the connection so made that if battery is disconnected the rectifier is also disconnected.

(b) Battery arrangement for Track circuit in Apparatus cases should be as per Drg. No. CORE/S&T/ALD/SK/481/99.

(IX) Feed end and relay end tail cables for track circuit shall be 2 core 2.5 sq. mm for Lead Length less than 90 mtr. and 4 sq. mm for lead length more than 90 mtr.

(X) Non deteriorating non indicating type of fuses of 2 Amp / 3 Amp shall be only used.

(XI) Removing of existing block joints to manage the single rail track circuit. All materials except Glued joints, track feed battery chargers, relays, underground cables, machine fishplate with longer nuts and bolts required for installation and commissioning of track circuit shall be supplied by contractor including but not limited to the item mentioned below in the list.

(a) 'Disc' Type track feed Resistance as per Drg. No. SA - 20161 - 66M, bonding wire 8SWG bond wire clip, channel pin single groove.
(b) Non deteriorating non-indicating type fuse of 2 AMP.
(c) Insulation for rail joint, gauge tie plate, stretcher bar and switch extension bracket.
(d) Choke B Type as per IRS Specification No. IRS - S - 65/83 latest.
(e) As many Track Lead Jn. Boxes as required.

ITEM 7. CABIN & RELAY / EQUIPMENT / BATTERY ROOM

(I) Supply of prewired composite relay rack similar to SE railway sketch no. 83/5/1 alt. B and fixing arrangement for neutral plug in relays 'Q' Type, lamp proving Relays and shelf type relays etc. Fixing arrangement for fuses and terminal block M6 (ARA Terminal/wago terminals) etc. should be in conformity with the SE railway sketch no. 83/5/1 alt. B.

(II) Fixing of relay rack, ARA terminals / Wago terminals etc, fuses, relays and relays base and all other accessories in the relay rack and termination of outdoor cable.

(III) Internal wiring of relay room and cabin shall be as per item 10(VII) of Technical Specification of Enclosure-I and approved circuit diagram. Connecting wire to different cables equipments, batteries, fuse board, circuit controller, lever lock, and inter connection wiring. This also includes termination of cables/wires of block Instrument of Relay Rack, dressing, bunching and ladder arrangement for supporting wire runs etc. This also includes replacement of non immunized relays and fixing of new relays and its wiring as required for repeating relays etc. with immunized relays, in case of modification to the existing MACLS installation to suit 25 KV AC Traction.

(IV) Providing antitilting wooden arrangement with contractor's materials for shelf type relays.(Ref. Drg. No. NBRE/SIG/GEN/050)

All the materials except relays and ARA terminals/wago terminals for the above work shall be supplied by the contractor including but not limited to the items mentioned below in the list.

(I) Fuse with base.
(ii) PVC wire.
(iii) Terminal strip and hylam strip.

(V) Supply and installation of high voltage rack similar to S.E. Rly's Sketch No. 83/5/1 ALT.B for over all dimensions. High voltage transformer, MCB switches & ARA terminal/wago terminals should be fixed as per Drg. No. CORE/S&T/SIG /Tender/SK/43/88 and should be wired as wiring diagram. Main outdoor cables for 300 volts and signal feed circuits only will be terminated on high voltage rack. Covering of high voltage terminals will also be done by the contractor.

(VI) Supply and fixing of main cable termination rack as per Drg. No. CORE/S&T/ALD/SK/376/93 alongwith fuses and fuse bases. Fixing of ARA terminals /wago terminals 'I' type transformers and all other accessories on the Rack and termination of outdoor cables. All the materials except relays, high voltage signal transformer and MCB switches for the above work shall be

supplied by contractor including but not limited to the items mentioned below in the list.

(a) Fuse with base.
(b) PVC wire.
(c) Hylam strip and terminal strip
(d) PVC Cover on ARA Terminals/wago terminals having High volts feed.

ITEM 8. CABIN EQUIPMENTS/SM'S OFFICE EQUIPMENT: -

(I) Supply and fixing of wooden shelves salwood 50 mm thick over the lever frame and SM's slide in cabin and SM's office/L - xing respectively.

(II) Fixing of Signal Slot. Point indicator and indicator lamps in the cabin as per approved circuit diagram.

All materials for the above work shall be supplied by the contractor including but not limited to the following items: -

(a) Luminous indicator RED, YELLOW, GREEN, WHITE, ON, OFF, etc. as per approved circuit diagram.
(b) Luminous indicator, Stencil, N, R, as per approved circuit diagram.
(c) Sal wood Shelves (50mm thick).
(d) PVC wire.
(e) Indicator Lamp 12 Volt. 4 Watt.

(III) Fixing of Terminal Block M6 (ARA Terminal) on 6 mm. thick hylam sheet in ASM's slide box/ terminal Board and wiring as per approved circuit diagram. This includes supply of all materials except ARA Terminals, which is separate supply item.

(IV) All locking materials i.e. Dog, Bridle bar etc. shall be supplied by contractor. Overhauling and testing of Lever frame shall be carried out as per Para of overhauling of Signal Engineering Manual.

(V) Fabrication of frame for fixing circuit controller and lever lock and down rod of 32 mm dia. at one end 20 mm at the other end and connecting to circuit controller arm and lever tail. Fixing of circuit controller/lever lock and frame work to be done from angle iron as per instruction of Engineer at site. Angle iron size should be 50 mm x 50 mm x 6 mm.
All the materials except point rodding (Solid) 32 mm for this work shall be supplied by the contractor.

ITEM 9. POWER SUPPLY EQUIPMENT:

(I) Fabrication and fixing arrangement for providing battery charger, transformers, voltage stabilizers, inverters etc. and their connection with batteries, relay racks and block instrument has to be done by contractor .

(II) Fabrication and fixing of Cable run way to support all cables in relay room, power supply room and battery room has to be done by contractor.

(III) Acid and distilled water separately for charging of the cells shall be supplied and cells to be installed by the contractor. These shall be given initial charging as per procedure prescribed by the manufacturer and approved by the Rly. Which shall include at least two cycles of boost charge and discharge. The charged battery shall be installed in battery room/relay room on salwood battery rack (Drg. No. SK. DRG/OL/102)/ OR other drawings as mentioned in Schedule A (I) & A (ii)/RCC slab and in apparatus cases on shelves of 25 mm thick salwood. The contractor shall make arrangement for initial charging of secondary cell at a central place. The charging arrangement shall be inspected and approved by Engineer in charge and witnessing of actual charging and necessary shall be done by authorized representative of Engineer - in - charge.

(IV) Manufacturing with Contractor's timber Sal wood plank of 200 mm x 50 mm size supported by MS angle of size 65 mm x 65 mm x 8 mm grouted into the wall at every 2 - 3 ft. and fixing of additional equipment in connection with RE Modification for one Station/Cabin.

(V) Installation of power supply equipment in relay room/equipment room as per typical power supply arrangement diagram provided.

(VI) Installation of DG set will be on 25 cm high brick platform (above ground level) and plastering with cement mortar 1:3 of 6 mm thickness to give smooth surface suitable for installation of DG Set with cushy foot anti vibrating mounting, which will be supplied by the contractor. The platform should be capable to bear the load and vibration shocks so that cranks should not develop.

(VII) Installation of control panel on wall in DG Room and subsidiary control panel in SM's office/cabin as specified by Engineer In charge at site.

(VIII) Supply and fixing of M.S. pipe 'B' class of suitable diameter covered with layer of Asbestos rope of half inch dia around it for exhaust of fume.

(IX) Supply and laying of 1 no. PVC insulated and PVC Seathed 6 sq. mm copper conductor 4 Core Power cable of 1.1 KV Grades as per IS specification No. IS-1554 pt. I in between DG set and control panel and subsidiary control panel (in SM's Office/Cabin).

(X) DG Supply is required to be extended to equipment Room and ASM's Room in consultation with Engineer at site through power cable.

ITEM 10. MISCELLANEOUS:

(I) Painting of all equipments such as signals, shunt signals /calling on signals, electric point detectors, track circuit equipments, apparatus cases, junction boxes, track lead jn. boxes, cable marker, point rodding, crank, compensator, all type of Relay Racks, CT Racks and any other equipment related to signaling works etc. as per relevant provisions of 'Signal Engineering Manual'. This includes supply of all painting materials.

(II) Marking of all circuit particular near terminals on terminal board/rack in apparatus cases, jn. Boxes / relay room/ SM's room and relay nomenclature, fuse nos. Equipment nomenclatures as per approved terminal chart and provision of 'Signal Engineering Manual'.

(III) Ink diagram board (size 1 meter x 0.5 meter x 20 mm thick) in SM's office/cabin of salwood with white sunmica having aluminum angle (1" x 1" x 1/8") on all four sides duly painted as per approved SWR diagram.

(IV) Supply and fixing of each earth electrode as per drawing No. RE/S&T /SIG/Tender/SK/398/94 for apparatus cases, signal post and other equipment as per instruction on earthing of S&T equipment.

(V) Supply and Laying of earth lead mild steel flat of size 35 mm x 6 mm and fixing of lead M.S. flat to earth electrode and lever frame, signal post & apparatus cases as per Drg. No. CORE/S&T/ALD/SK/591/2008, 592/2008 & 593/2008 respectively and instructions on earthing at S&T equipment and providing cement enclosure for earth electrode as per drawing No. RE/S&T/Sig/Tender/SK/13/85 Alt.- 'A'.

(VI) Illuminated indication diagram board of size 1.2 mtrs. x 0.6mtrs x 20mm thick shall be provided in the SM's office/cabins. This shall be made of salwood with white sunmica top having aluminum angle 1"x1"x1/8" on all four sides duly painted as per approved station working rule diagrams. The indications for signals, points, slots, track circuits, etc. shall be provided on this board by means of LEDs of P.G. lamps. The signal and track circuit indications shall be provided near the signal and track circuits painted on the diagram whereas slot indications shall be provided below the painted yard diagram.

(VII) Instruction for wiring:

The wiring of equipment to be carried out with the following PVC wires approved by Engineer - In charge at site.

(A) Wiring inside one rack for shelf type and plug-in type (metal to carbon) contact relays.

1. Relay rack wiring housing plug-in type relays conforming to BRS - 930 & shelf type relays conforming to BS-1659 shall be made with PVC insulated unsheathed, flame retarding type single core flexible wire 1100 V- grade having 16/0.2 mm dia annealed copper conductor and nominal cross

sectional area of 0.5 sq. mm of common colour code to the specification no. IS-694. Single strand and wires shall not be used for wiring of these relays, the above wires shall be terminated on eyelets/ lugs of standard design. All Wires and related materials shall be supplied by contractor.

2. For wiring from one relay rack to another relay rack (inter rack wiring) using plug-in type and shelf type relays: Multi core Un - armoured cable of 1.12 mm dia. and 1.0 sq mm cross section to the Specification No. IS-694 or IRS: S-63 shall be used for wiring purpose. All Wires and related materials shall be supplied by contractor.

3. The use of intermediaries like terminal blocks, tag blocks etc. is not recommended in normal practice as these are likely to lower down the insulation resistance of the system. If the use of these is unavoidable the same shall be of standard design and type conforming to standard specification and supplied and installed by contractor.

4. The use of intermediate rack for wiring shelf type and plug in type relays is not recommended unless it is otherwise unavoidable and specially asked for.

5. All spare contacts of relays need not be wire. If it is considered necessary few spare contacts may be wired and terminated on terminal/tag blocks as advised by the engineer in charge.

(B). Wiring of proved type relays (metal to metal contact relays)

The use of Intermediate Distribution Frame (IDF) with these type of relays which is a common practice and to continue.

1. For wiring the above relays the use of single strand - tinned copper wire of 0.6mm and 1.0 mm dia 1100V grade PVC insulated flame proof shall be used. The use of multi core cable of 100 core, 60 core, 40 core and 20 core having the above conductor dia and grade is recommended. Size of conductor shall be chosen based on current to be carried through these conductors. All wires and related materials to be supplied by contractor.

2. The wire and cable used shall generally conform to IS - 694. (Reference: RDSO's Letter No. STS/E/RRI/SCHEME dated 12.01.1987). All wires and related materials to be supplied by contractor.

(VIII) General Specifications/ instructions:

1. The works shall be carried out according to the drawings approved by the Railway and shall conform to the provisions of the 'Signal Engineering Manual' 'Schedule of Dimension' and 'Manual of Instructions' for installation of S&T equipment on 25 KV, 50 Cycles, AC electrified section as modified from time to time unless deviations, if any, are specifically approved by the Engineer.

The contractor shall be solely responsible for the proper execution of the work as per the said deviation and specifications.

2. Conforming to the signaling plan and cable plan the positions of foundations of signal posts, Apparatus cases, junction boxes, cable termination boxes, Diesel Generator, Shunting /Block Section limit Board, lighting Boards, Power Panel as required will be indicated by the Engineer's representative at site before the commencement of the work at the station.
3. The excavation of pits for various types of foundation shall be done as per drawings or the instructions given by Engineer's representative and during the excavation, the earth of the pit shall be thrown on plain ground away from left out earth if any, shall be thrown outside the Railway premises.
4. Signal posts and sighting Boards shall be vertical and plumb and the gap between the base and the signals post shall be filled with wool or any other approved substances.
5. The signal unit shall be properly mounted, secured and focused.
6. Cable for Signal Units shall be taken inside the signal post. Exposed cable should be protected by suitable means.
7. The Apparatus cases, junction boxes, and cable termination boxes shall be vertical and plumb.
8. Cable openings in Apparatus case, junction boxes, and in Relay Rooms should be covered by sand. Top should be plastered by cement for apparatus cases and Jun. Boxes.
9.
    a) Cable should be properly terminated in the terminal Boards/racks.
    b) Cable terminated inside Apparatus cases, Jn. Boxes and in Relay room should be fixed by clamp or by any other methods indicated by Engineer.
10. Wires shall be terminated properly on terminals.
11. Wiring should be done in a neat manner and wires neatly bunched and tied unless they are drawn troughs or cable ladders.
12. No joints are permitted in the connecting wires.
13. Provision of insulation wherever required to follow standard approved Railway practice for the purpose.
14. Rod joints for points and detectors should be only smithy-welded and the weld will be tested by the Engineer or his representative before the welded rod is installed.
15. Track circuit connection to the rails jumpers should be fixed by channel pins to the rails. Any alternative method to be adopted should be approved in advance by the Engineer.
16. No work on a working installation such as point or track circuit, should undertaken without the permission of the Engineer's representative at the site of work.
17. For each station cable route plan will be prepared by contractor by showing exact location of cable at an intervals of not more than 200 Meters or wherever there is change in alignment so that the same is located easily by the Railway official/ contractor. Proposed cable route plan should be submitted to Divisional Authorities (Sr. DSTE, Sr. DEE, Sr. DEN) and obtaining permission from them in writing before the cable laying work at the station.

However under the exigencies of the local conditions or for any consideration the Engineer in-charge of the work will mark the route of the cables in chalk or lime, as per cable route plan/ cable plan and the Engineer's instruction to him, which shall be taken by the contractor shall lay the cables only along this route. The contractor shall be present at the time of marking the route of the cables and he shall furnish to the Engineer's representative required quantities of lime, rope, labour etc. for carrying out this work at the cost of the contractor.

18.1 The contractor shall study the approved cable route plan and follow it meticulously to ensure the safety of the already laid Railway cables, emergency sockets etc are not endangered.

18.2 The name of the contractor, his contact telephone number, the nature of the work shall be notified in Divisional Test-room by representative of Engineer in-charge of the work.

18.3 Completion cable route plan should be finalized station by station as soon as the work is completed.

19 Cable laying should commence only after the depth and quality of trenches, Chases, quality of bricks and arrangements for trench filling etc. are inspected jointly by the Engineer's representative and contractor's representative approved by the Engineer's representative.

19.1 The work of excavating the trench and laying of the cable should proceed in quick succession, leaving a minimum time between the two activities.

20 Trenching for track crossing and laying of cable across the track should be done only in presence of the Engineer's representative.

21 Cable shall not be normally taken over the running track at the time of cable laying by the Contractor, as this likely to cause accident to trains and damage to cable. If at any time, the cable has to be taken across the track, it shall be done only in the presence of the Engineer's representative and after due safety precautions have been taken.

22 All materials and equipment to be supplied and used in execution of the work should be to IRS wherever applicable or to ISS, if IRS is not available. In cases of material for which neither IRS nor ISS is available, detailed specification with the drawings have to be supplied for the approval of the Railway.

23 Installation of control panel, cable termination and relay rack at the respective places shall be carried out as per circuit diagram approved by the Railways providing interconnection arrangements between the rack and control panels are to be made as required.

24 The equipments are to be wired in Relay Room, Control Panel, Power supply arrangements, apparatus case, cable Termination box. Battery Box and in other locations.

25 Cable termination racks should be erected in the relay room. Suitable cable ducts as required shall be provided to bring all outside cable to the termination rack. RCC slabs shall be manufactured at site and covered. All the Cables are to be neatly fixed and terminated in order. Relay Racks shall be mounted in the Relay Room as per the position indicated by the railway representative.

26 Interconnection:

Interconnection between terminal rack/board and Relay Racks, shall be carried out providing ladder arrangements or by any other arrangements as instructed by Engineer's representative. Interconnection between control panel and other racks shall be with ladder arrangement. The ladder arrangements of suitable capacity are to be fixed neatly and firmly with proper support.

27 Point Machine:

A) Electrical operated Point Machine shall be fitted on long wooden / concrete sleepers of extended gauge tie plate clear of infringement. The Point Machine shall be fixed with proper bolts and nuts with correct size holes through the sleepers to avoid play. The point machines shall be installed as per manufacturer's instructions and standard practice of the Zonal Railway.

Adjustment and Testing:

The Point Machine shall be worked both ways with proper feed without undue friction. The point stretcher bar and lock connections are adjusted in such a way that with a 5 mm thick test piece obstruction placed between the switch and stock rail at 150 mm from the toe of switch.

i) The point does not get locked.
ii) The point detection circuit is not completed.
iii) The friction clutch disengaged.

B) All materials including ground connections except Electric Point machine, gauge tie plate, stretcher bar and wooden sleepers shall be supplied by contractor.

28 Electrical Point detector:

Electrical Point Detector are to be adjusted in such a way that with a 5 mm thick test piece obstruction placed between the switch and the stock rail at 150 mm from the toe of switch, the point detection circuit is not complete.

29 Testing and commissioning:

Testing and commissioning consist of testing of circuits, adjustment of track circuits, adjustment and testing of points as per Signal Engineering Manual, testing power supply stabilizers, Generators, etc. energizing and testing of colour light signal and final commissioning of entire signaling arrangement for traffic use.

The equipments shall be tested along with Railway representative as per approved circuit diagram. The testing arrangements are to be provided by contractor prior to commissioning.

30 Painting of signaling equipment should be done as per the standards laid down in the Signal Engineering Manual in specified standard colours using paints of superior quality to Indian Standard specification.

32 With the help of Mega ohm meter insulation resistance test shall be conducted on all cores of each cable jointly by the representative of Engineer and the contractor before the cable is connected or wired to the signaling equipment. The insulation resistance shall be measured between a core and all other cores connected together to the sheath and earth. The results of the insulation resistance test shall be tabulated in the Form given as **Annexure-2** and the Form should be signed by the representative of the contractor and Engineer.

33 With the help of Wheat Stone Bridge, loop resistance test shall be conducted on all cores of each cable jointly by the representative of Engineer and the

contractor before the cable is connected or wired to the signaling equipment. The results of the loop resistance test shall be tabulated in the Form given as **Annexure-3** and the Form should be signed by the representative of the contractor and Engineer.

34 (a) Earth resistance of the Earth Electrode shall not exceed as stipulated in "Signal Engineering Manual".

(b)Earth Electrode shall be tested as per instruction of Earthing given as **Annexure-1** and result shall be recorded in the Form given as **Annexure-4** The Form should be signed by the representative of the contractor and Engineer.

35 Wooden cross of approved type should be properly provided for newly erected colour light signals, till they are commissioned.

36 Wooden Boards and Shelves are to be properly polished, before fixing the terminals and equipments on it, as advised by the Engineer.

37 All the equipment, relays and terminal are to be marked by lettering on it as advised by the Engineer.

(IX) Earthing of equipment shall be done as per instruction on earthing of Signalling and Telecom. Equipment in 25 KV 50 Hz AC Electrified section as given below in Annexure-1

ANNEXURE-1

Instructions on earthing of signalling and telecom. equipment in 25 KV, 50 Hz AC electrified sections.

1. SCOPE:

These instructions pertain to earthing mechanical, electrical block signaling equipment, like lever frame in the cabins, terminal boxes connecting the ends of the cables, metallic sheathing and armouring of the cables, lightning and spark arrestors, signal location boxes, signal screens, block instruments etc.

2. PURPOSE:

The object of the earthing may be one or more of the following:

(I) To afford safety to the operating and maintenance personnel against electric shock due to the apparatus casing or other exposed parts attaining a dangerous potential relative to earth through electro-magnetic, electrostatic or conductive coupling with the OHE installation.

(II) To ensure safe and reliable operation of the equipment by the limiting or eliminating the induced voltages in the signal and block circuits, cable metallic sheath and armour earthing as also block filter earthing are examples of this type of earthing. To protect the equipment against build up of unduly high Emfs which can cause dielectric break down mostly due to the physical contact with live OHE equipment as for instance when the catenary wire falls on the track and also against lightning discharges. Such protection by earthing is generally given by interval of Discharge Lightning Dischargers etc.

The above two types of earthing are known as "equipment earthing" in contrast to "System earthing" which is employed to conduct heavy currents under fault conditions to ensure affective and rapid operation of the protective devices.

3. SOIL RESISTIVITY:

3.1 The soil is generally made up of silicon dioxide and aluminum oxide which have excellent insulating properties. The earth conductivity is however essentially electrolytic in nature and is therefore affected by moisture content of soil and its chemical composition and concentration of salts dissolved in the contained water. Grain size and distribution and closeness of packing are also contributory factors since they control the manner in which the moisture is hold in the soil. Many of these factors vary locally and some seasonally and therefore, the soil resistivity figures should always be co-related not only with the location but also with the climatic conditions. In addition to the above factors, where the soil is stratified, the effective resistivity depends not only on the surface layers but also on the underlying geological formation.

3.2 The soil temperature also has some effect on the soil resistivity but is important only near and below the freezing point necessitating the installation of earth electrodes at depth to which does not penetrate.

4. TREATMENT OF SOIL:

4.1 Multiple rods in large number may sometimes fail to produce an adequately low resistance to earth. This condition arises in installations involving soils of high resistivity. To reduce the resistivity of soil, it is necessary to dissolve in the moisture normally contained in the soil some substance which is highly conductive in its water solution. The most commonly used substance are sodium chloride (also known common salt), calcium chloride, sodium carbonate, copper sulphate, salt and soft coke and salt and charcoal in suitable proportions.

4.2 In the case of salt and soft coke and salt and charcoal moisture the earth electrode should be surrounded in the earth pit by alternate layers of finally divided coke, crushed coal of charcoal and common salt for at least 150 mm all round. Though substantial reduction in earth resistance can be achieved by the coke treated electrode, this method results in rapid corrosion of not only of electrodes but also the associate bonding. Coke treatment shall be used when absolutely necessary and the coke treated electrodes shall not be situated within 6 meters of other metal structure.

4.3 With average and high moisture contained, the above mentioned agents form a conducting electrolyte throughout the wide region surrounding the earth electrode. Approximately 90% of the resistance between a driven rod and earth lie within a radius of about 2 meters from the rod. This should be kept in mind when applying the agents for artificial treatment of soil. The simplest application is by excavating a shallow basin around the top of the rod, one meter in diameter and about 30 cm deep and applying the artificial agents in this basins. The basin should be subsequently filled several times with water which should be allowed each time to soak into the ground, thus carrying the artificial treatment, in electrolyte form to considerable depths and allowing the

artificial agent to become diffuse throughout the greater part of the effective cylinder of earth surrounding the driven rod.

5. EARTH RESISTANCE:

5.1 The total resistance of an 'earth' is the sum of three separate resistance, (a) the resistance of the conductor joining the earth electrode to the installation (b) the contact resistance between the surface of the earth electrode and the soil, and (c) the resistance of the body of soil surrounding the earth electrodes.

5.2 Normally the first two resistance are negligibly small compared with third, so the resistance of an 'earth' is primarily determined by the nature of soil and not by the electrode itself.

6. DESIGN OF THE EARTHING ARRANGEMENTS:

6.1 Earth Electrodes

6.1.1 Although the electrodes material does not affect the initial earth resistance, are should be taken to select a material which is resistant to corrosion in the type of soil in which it will be used. Under ordinary conditions of soil, use of galvanized iron or mild steel electrode is recommended. In cases where soil corrosion is likely to be excessive, it is preferable to use either copper or copper clad electrode. The electrodes shall be free from paint, enamel or grease.

6.1.2 Earthing arrangement shall normally consist of one or more galvanized iron pipes to not less than 38 mm internal diameter and not less than 2.5 meter in length with a spike at one end and alugat at the other for connecting the earth lead or galvanized iron/ steel rods of not less than 16 mm dia. or copper rods of not less than 12.5 mm dia. and not less than 2.5 meter length. While the pipe is embedded vertically the rod electrodes are driven vertically in the ground, when rocky soil is encountered at a depth of less than 2.0 meters or the length of the electrode, the electrode may be buried inclined to the vertical, the inclination being limited to 30^{0} from the vertical. The earth electrodes shall not be buried in a position likely to cause an obstruction or where it is likely to be damaged.

6.1.3 The resistance of the pipe and driven rod electrodes may be calculated from the following formula:

$$R = \frac{100\,P}{2.\pi\,L}\log_e = \frac{4\,L}{d}\ \text{ohms}$$

Where,

P= Resistivity of soil in ohm-meter.
L= Length of the rod or pipe in cm. and
d= diameter of rod or pipe in cm.

6.1.4 The above formula shows that the resistance to earth of a driven rod/pipe electrode depends to a larger degree upon its buried length and to a lesser extent upon its diameter. The resistance of these electrodes in a soil of uniform resistivity decreases with depth but there is little to be gained by driving the rod to more than 3 to 3.5 meters. Also the decrease in the resistance with increase in rod diameter is not significant. It is, therefore, recommended to use rod electrodes of such diameters as can easily withstand the strain of driving.

6.2 Earthing Leads

6.2.1 Earth wires shall be protected against mechanical damage and possibility of corrosion particularly at the point of connection of earth electrode.

6.2.2 The earthing lead should be mild steel flat of size 35 mm x 6 mm or copper wire of 29 sq. mm cross sectional area (19 strands of 1.4 mm dia.). In case the conductor is buried underground, it should be protected from corrosion by an application of suitable anticorrosive paint or bitumen or varnish. The length of the cable so treated should extended half a meter beyond the buried length.

6.2.3 The earthing leads should be of adequate size to offer negligible resistance.

6.3 Earth Electrode:

6.3.1 While the fundamental nature and properties of a soil in a given area can not be altered, local conditions can be utilized in choosing suitable electrode sites as also a method of preparing the site selected to secure an optimum resistivity in strata under the surface loam, clay and lime stone have lower resistivity, while sandy and rocky soils have higher resistivity. Therefore, the site for earthing should be chosen in the following order of preference:

a) Wet marshy ground and grounds containing refuse, such as ashes cinders and brine waste.
b) Clayed soil or loam mixed with varying quantities of sand.
c) Clay and loam mixed with varying proportions of sand, gravel and stone, and
d) Damp and wet sand pit.

6.3.2 A site should be chosen which is naturally not well drained. A water logged situation, however, is not essential unless the soil be sand or gravel as in general no advantage results from an increase in moisture content above about 15 percent to 25 percent. Perennial wells may also be used as sites for earth electrodes with advantage where the bottom of the earth is rocky.

6.3.3 Electrodes should preferably be situated in a soil which has a fine texture and which is packed by watering and ramming as tightly as possible. Where practicable the soil should be shifted and all lumps should be broken up and stones removed in the immediate vicinity of the electrodes.

6.3.4 Recourse may be had to chemical treatment of soil to improve the conductivity. Common salt is generally used for this purpose and the addition of less than one part of weight of salt to 200 of soil moisture has been found to reduce the resistivity by 80 percent but there is little advantage in increasing the salt content above 3%. Calcium Chloride, Sodium Carbonate and other substances too have been found beneficial. But before chemical treatment is applied, it should be verified that no deleterious effect on the electrode will result.

6.3.5 Use of land should be made where possible or natural salts in soil produced by bacteriological action on decaying plants. The resistivity of the soil on which plants are growing will be lower than that of a similar soil in the absence of plants.

6.3.6 In places where the soil is extensively corrosive, the soil may be chemically examined before deciding the material of the earth electrode.

6.3.7 As far as possible, the earthing arrangement should be located in the natural soil. The made up soil which has not consolidated or is likely to be eroded by weather, should be avoided.

6.3.8 Where more than one earthing arrangements are employed, the distance between earthing electrodes shall not be less than three meters. The earthing leads for separate earthing arrangements should be electrically insulated from each other throughout and also from metallic structures in contact with the different earthing arrangements.

6.3.9 The minimum clearance of equipment earth from system earths provided by the Electrical Department either of the Railways or of the other Administrations should be 20 meters.

7. EQUIPMENTS TO BE EARTHED:

7.1 **Separate earthings shall be provided for the followings.**

7.1.1 The lever frame and other metallic frames of the cabin.

7.1.2 As the underground cable enters the location box or the cabins, the cable termination boxes, connecting the ends of the cable, the metallic structures supporting the terminal boxes, if any, the metallic shoothing and armouring of the cables shall all be connected together to the same earthing. The lightning/ sparks arrestors shall also be connected to the same earthing.

7.1.3 A separate earthing shall be provided for each block instrument.

7.1.4 In the location boxes, in which only the local cable terminate, it is not necessary to ground the cable termination boxes and the metallic frames supporting them. The local cables are those which connect a single apparatus to the location box or as the case may be to the cabin (i.e. Track Relay in the cabin).

7.1.5 Where more than one earthings are used, the distance between earthing pipes shall not be less than 3 meters. The conductors leading to those earthings should be electrically insulated from each other throughout and also from metallic structures connected to different earthings.

7.1.6 The telecom. equipment may be connected to lever frame earth vide Para 7.1.1 above or the cable earth vide para 7.1.2 above subject to the provision laid down in para 7.1.7 below.

7.1.7 There should not be any possibility of simultaneous human contact with metallic bodies connected to different earthing. Wherever it is not possible to provide suitable spacing or partition between various metallic bodies, mentioned in Para 7.1.1 & 7.1.2, they must be connected to a common earthing. In case of signal provided on bracketed posts or gantries located above the contact wire level and falling within 2 meters from the electrified track, the protection screen shall be connected to an earth.

7.1.8 The resistance of the earth in all the above cases shall not exceed as stipulated in 'Signal Engineering Manual'.

8. MEASUREMENT OF EARTH ELECTRODE RESISTANCE (FALL OF POTENTIAL METHOD).

8.1.1 In this method two auxiliary earth electrodes besides the test electrode are placed at suitable distances from the test electrode. A measured current is passed between the electrode ‘A’ to be tested and an auxiliary current electrode ‘C’ and the potential difference between the electrode ‘A’ and the auxiliary potential electrode ‘B’ is measured.
The resistance of the test electrode ‘A’ is then given by R=V/I where;

R= resistance of test electrode in ohms.
V=reading of the voltmeter in volts
I=reading of the ammeter in ampere.

If the test is made at power frequency that is 50 Hz the resistance of the Voltmeter should be high compared to that of auxiliary potential electrode ‘B’ and in no case should be less than 20,000 ohms.

The sources of current shall be isolated from the supply by a double wound transformer. At the time of test, when possible, the test electrode shall be separated from the earthing system. The auxiliary electrodes usually consist of 12.5 mm diameter mild steel rod driven up to 1 meter to the ground.
All the test electrodes and the current electrodes shall be so placed that they are independent of the resistance area of each other. The electrode 'C' shall be placed at least 30 meters away from the test electrode 'A' and the auxiliary potential electrode 'B' shall be placed midway between them.
Unless three consecutive readings or test electrode resistance with different spacing of electrode agree the test shall be repeated by increasing the distance between the electrodes 'A' upto 50 meters and each time placing the electrode 'B' between them.

9. MEASUREMENT OF EARTH RESISTIVITY

9.1 Earth tester normally used for these tests comprise the current sources and meters in a single instrument and directly read the resistance. The most frequently used earth tester is the four terminal megger.

The resistivity may be evaluated from equation as given below:

$$P = 2 \pi S R$$

Where:
P= resistivity of soil in ohm-meters.
S= distance between successive electrodes in meters.
R= Megger reading to ohms.

9.2 Test Procedure

At the selected test site, four electrodes are driven into the earth along a straight line in a chosen direction at equal intervals S (unequal spacing may also be used but this will make the formula unnecessarily complicated).The depth of the electrodes in the ground shall be of the order of 10 to 15 cm. The megger is placed on a steady and approximately level base, the link between terminals P1 and C1 opened and the four electrodes connected to the instrument terminals. An approximate range on the instruments is then selected; to obtain clear readings, avoiding the two ends of the scale as far as possible. The readings are taken while turning the crank at about 135 revolution / min. resistivity is calculated by substituting the values of 'R' in the equation P=. □2π.S R.

ANNEXURE-2

THE FOLLOWING ARE THE INSULATION RESISTANCE TEST RESULTS CONDUCTED BY US ON ---------- CORE CAPACITY CABLE LAID BETWEEN --------- AND ------- ON DATED-------- AT------STATION.

Core	1	2	3	4	5	6	7	E
1								
2								
3								
4								
5								
6								

Signature of representative Of the contractor

Signature of representative of the engineer

ANNEXURE-3

THE FOLLOWING ARE THE LOOP RESISTANCE TEST RESULTS CONDUCTED BY US ON ---------- CORE CAPACITY CABLE LAID BETWEEN --------- AND ------- ON DATED-------- AT------ STATION

Core	1	2	3	4	5	6	7	E
1								

2								
3								
4								
5								
6								
7								

Signature of representative
Of the contractor

Signature of representative
of the engineer

ANNEXURE-4

THE FOLLOWING ARE THE EARTH RESISTANCE TEST RESULTS CONDUCTED BY US AT ----------

LOCATION OF EARTH ELECTRODE	RESISTANCE	DATE

Signature of representative
Of the contractor

Signature of representative
of the engineer

ITEM 11(a). Releasing of signals, signalling gears & stacking.

Releasing the fitting of signal post including bracketed or Gantry posts, bringing down the posts including bracketed or gantry posts to ground. Removing the fitting and signal posts to the Station and stacking nearly at the location indicated by Engineer's representative. This work includes refilling of pits, dug of excavation of the signal and bringing out it to normal soil label i.e. Gantry Bracketed Doll 2/3/4, Signal posts, Shunt Signal Ground/post Type etc. Releasing complete signal wire transmission including pulley, pulley stacks turned out wheels including its foundation in soil taking them to the Station and stacking neatly at one location indicated by Engineer's representative. This work includes refilling of pits Dug for excavation of the pulley stakes and Turn out wheels foundations & bringing it to normal soil label.

Releasing the complete, point fitting including point locks, Detectors. Point Mechanism, Lock Bars and its connections Rodding etc. Taking them to the station and stacking neatly at one location indicated by Engineer's representative. Releasing of lever frame complete with all connections & fittings including at all connections in the cabin basement including station and stacking neatly at one

location indicated by Engineer's representative. Releasing of double wire levers including double wire compensators and its connection and all other connections to lever frame. upto lead out and stacking neatly at one location indicated by Engineer's representative.

Releasing of double wire lead out complete with all connections including turn-out wheel nest and its fixing arrangements and stacking neatly at one location indicated by Engineer's representative.

Releasing of all existing electrical connections provided in the SM's office and cabin including their connections to Relay Room and Battery Room and stacking neatly at one location indicated by Engineer's representative.
Releasing of existing electric equipments/Batteries and its connections in the Relay Room, Battery Room & SM's office & Stacking neatly at one location indicated by Engineer's representative. Releasing of 'A' Type foundation (in earth work) and stacking neatly at one location indicated by Engineer's representative. This work includes refilling of pit dug for excavation of the 'A' Type foundations and bringing it to normal soil level. Releasing the post of overhead alignment, insulations, Cross Arm, Guys and other fittings and wires, bringing down the posts to the ground and taking them to the station and stacking nearly at one location indicated by Engineer's representative. This work includes refilling of pit dug for excavation of the post and bringing it to normal soil level. Releasing Sighting Board, shunting limit Board and bringing sighting board, to the location as indicated by Engineer's representative and refilling pit Dug for excavation of the sighting board and bringing it to normal soil level. Releasing of existing Apparatus cases/Jn. Boxes/Battery Boxes/Track lead Boxes with gear fittings and stacking neatly at one location indicated by Engineer's representative. This also includes removal of supporting Rail/Angle/Channel Support and refilling of pit, Dug for excavation of these fittings boxes and bringing to normal soil level. Releasing of SM's Slide control frame and stacking neatly at one location indicated by Engineer's representative. Releasing of over ground signalling cable on cable route including cable markers, cable supporting posts and its fitting and coiling the released cable & bringing all released materials and cable to locations as indicated by the Engineer's representative and stacking them neatly. This also includes refilling up of excavation trench to normal soil level.

ITEM 11(b). ADDITIONAL CONDITIONS (For releasing of existing Mechanical Signalling Gears)

(I) All tools and plants required for work shall be contractor's own.
(II) Cart and any other vehicles required for transportation to be arranged by the contractor.
(III) While releasing the material, the contractor should take care that material are released intact and in sound working conditions as working on the day.
(IV) Breakable items such as roundels, relays, relay cupboards etc. are carefully released without any damage. All materials and electrical equipment released are fitted with their relevant connection and are in sound working condition, as existing on the day released.

(V) Released materials are stacked neatly, item wise and at the given location and should be such that it is not interfered with other released equipments which might cause damage to the materials while shifting.

(VI) Released materials such as relays/electrical equipments should be protected from pilferage and damage. In the event of loss and damage, the recovery will be made from contractor's material and keep accountal of released material till such time they are taken over by an authorized representative of Engineer - in - charge.

(VII) The material damaged while releasing should be stacked separately and its separate accountal maintained by the contractor. Such material should be produced before Engineer - in - charge for his inspection for acception cause and responsibility of damage. Any damage caused due to ageing and any other unavoidable causes may be accepted by Engineer - in - charge, which will be taken over by his representative for arranging the disposal of such material. The Engineer-in-charge, if not arranging the disposal of such material. The Engineer-in-charge, if not satisfied with the reason, or cause forwarded by the contractor for damage of any equipment/material, the cost of such material will be recovered from the contractor at book rate or the market - rate. Whichever is higher plus other charges as applicable. The decision of the Engineer - in - charge will be final.

(VIII) Engineer-in-charge may reject any work done for releasing given under schedule; if he finds that any such work is not carried out as per the details given in the schedule & work done by the contractor will not be eligible for any payment for such work which is rejected by the Engineer-in-charge.

(IX) The work of releasing of existing signalling gears as per enclosed schedule A (II) Technical Specification are required to be executed by the Contractor at the station as and when the work of conversion of mechanical signalling to CLS is taken in hand. The contractor will be advised 72 hrs. in advance from the date of commencement of such work. The contractor should be present from the first day of the conversion work for commencing the work of releasing.

(X) The work of releasing will be carried out successively as per above instruction at stations as and when conversion work is taken in hand.

(XI) Engineer - in - charge due to local conditions, prevailing may decide to abandon release of complete material at station/L- xing Gate of item appearing in Schedule reducing or canceling part or full quantity of schedule for which no compensation will be paid to the contractor.

(XII) After receipt of notice for commencement of work at a particular station as per Para IX as above, contractor will depute his authorized representative who will make Joint Survey with Railway Engineer - in - charge or his representative and jointly record actual items and quantities their of to be released materials with Railway, failing which, cost of short fall Materials will be recovered from him.

ITEM 12. Operation and routine maintenance of Diesel Generator set.

Operation and routine maintenance of Diesel Generator set installed at stations in sections for the purpose of reliable power supply for colour light signalling installations.

(I) For providing power supply to colour Light signalling in case of failure of local power supply from State Electricity Board, 2 or 3 DG sets (as mentioned in schedule) will be installed at each station, where colour light signalling is being commissioned. One of these DG sets will be started as soon as local power supply fails. Normally the DG set will be started by the station Master on duty by operating the remote push button provided for these purpose in his office, whenever the normal local power supply of state Electricity Board fails. The Station Master will also put the D.G. Set off again by operating the push button provided for these purpose in his office as soon as the local supply resumes. However, in case it is not possible for the Station Master on duty to operate any DG sets in case of failure of local supply by pressing the push button concerned due to any reason the DG set will be operated by the contractor's operator. For this purpose the contractor has to depute a D.G. operator round the clock at each station. The contractor's operator available at the station will have to start one of D.G. Set on instruction by the station Master Concerned. The contractor operator will ensure that the DG set work alternatively at 6 hours interval.

(II) The Contractor's operator will also be responsible for routine Maintenance of D.G. Sets installed at different stations as well as the controlled panel and batteries provided for functioning of self starting drive of D.G. Set. For this he will be required to check the fuel feed, lubricant, Temperature, output voltage, output current, electrolyte level of the batteries provided for the self starting mechanism. He will maintain the logbook for routine inspection of these items as per the Performa to be given by the Railway representative. The contractor's operator will also maintain separately for each DG Set with record of consumption of fuel and lubricant in the Performa given by the Railway representative. In case of failure of any DG set at any station, the contractor's operator will immediately stop the concerned DG set and start the other D.G. set. There after the contractor will arrange for immediate rectification of the fault, if it is Minor in nature i.e. all the faults excluding seizure of engine and burning of coil of alternator. He will also be the responsible to immediately inform the ASM on duty about the failure and nature of failure of that particular DG set.

NOTE:

(I) Diesel oil and lubricant required for operation of DG set will be supplied by the contractor at site. The sufficient amount of diesel oil and lubricant will be kept stored safely at the site.

(II) Where power supply from state Electricity Board is available but is not reliable, and whenever supply from Electricity Board fails and Generator is required to be operated, the time of starting the DG set and putting off the DG set should be clearly mentioned in the log book and the signature from the station Master on duty must be taken at the specified space and taken of confirmation of the working of D.G. Sets.

(III) All the materials required for the operation and routine maintenance of DG Sets. control panels and batteries like diesel fuel, lubricant waste cotton, distilled water, Grease, Sulphuric Acid, Meters, indication bulbs, etc. will be provided by the contractor.

(IV) The contractor's operator will ensure that the self starting system of DG set functions smoothly, so that the ASM on duty can put on the generator by the operating the remote push button when ever supply from State Electricity Board goes off. However, incase of failure of self-starting system, the contractor operator's will manually start the D.G. sets and ensure the early rectification of the fault itself starting system.

(V) Before starting the work, a joint survey in an approved manner will be done by the representative of Railway and contractor's Representative to as certain the average consumption of diesel fuel and the lubricant there of for each and every DG sets installed and required to be operated.

This result should be noted in D.G. History book which will contain all the details, such as date of last repair, date of installation, detail description of DG set including defects noticed, the date of last joint inspection & date of Joint Inspection etc.

There after periodic Joint calibration will be done on monthly basis to ascertain the average consumption of diesel fuel and lubricant of any variation in consumption is noticed since inspection. This should be noted in DG History Book. The total monthly consumption of Diesel fuel and lubricant will be calculated from the basis of this joint calibration for particular DG set.

(VI) The contractor should note that the sufficient amount of diesel fuel and lubricant should be stored at site in safe manner at least 100 liter diesel and 5 liter lubricant so that there should not be any difficulties for operation of DG set for want of fuel etc.

(VII) The contractor should note that in case of any train detention on account of failure of their operator in starting DG set due to any reason whatsoever they shall be liable for a recovery of two times the cost of operation per station day in each time.

(VIII) The contractor should note that the payment of the supply item such as diesel and lubricant may be made to the contractor by the Railway on receipt of the material at site but the measurement Book will be filed up not in a daily basis but in an appreciable time i.e. once in month or so.

ITEM NO. 13 Fabrication of apparatus cases and Junction boxes.

13.1 Hylam sheet size 960 mm x 450 mm x 6mm, 470 mm x 450 mm x 6 mm and 460 mm x 470mm x 3 mm shall be provided in Apparatus case single, Half and junction boxes respectively for fixing of Terminal Block M6 (ARA terminals/wago terminals) and fuses. Fixing arrangement for terminal block M6 (ARA terminals/wago terminals) and fuses etc. should be in conformity with the S.E. Railway sketch No. SK/DRG/OL/109 Alt. A. Terminal block M6 (ARA terminals/wago terminals) and fuses should be fixed in Apparatus cases & Jn. boxes as per Drg. No. CORE/S & T/ALD/SK/478/99, 479/99,480/99, 482/99,484/99 & 485/99 and wired as per approved termination diagram and circuit diagram. Shelves in apparatus cases and Junction boxes shall be of 25

mm thick Sal wood. Terminal block M6 (ARA terminals/wago terminals) should be fixed vertically. The location number is to be written/stenciled with letter if bold size of not less than 100 mm in block on both the doors. Power location shall be indicated as “PCT” with legend to read danger “400V” 230 volts as the case may be it shall be stenciled in white letters in RED back ground on the door with 50 mm red band around the PCT. The location with battery and battery charger shall be stenciled with legend B.B. and B.C. respectively in 100 mm letters. Cable termination arrangement in apparatus cases should be as per drg. No. CORE/S&T/ ALD/SK/400/94 Alt. A.

13.2 Fixing of equipment such as high voltage signal transformers, MCB switches and all other equipments in apparatus cases of schedule A (I) & A (II) and wiring of equipment as per wiring diagram. This item will be under taken in case where 300 volts signal feed circuit is required.

13.3.1 Fixing of equipment such as relays etc. in apparatus cases of schedule A (I) & (II) and wiring of equipment as per wiring diagram. All materials except ARA terminals / wago terminals and Rly. Supply items mentioned in volume -I (Annexure) for the above work shall be supplied by the contractor including but not limited to the following items.

(i) M.S. Angle, Hylam sheet.
(ii) Non deteriorating non-indicting type fuses with bases as per wiring diagram.
(iii) Wiring, bunching and dressing materials.
(iv) Sal wood 25 mm thick shelves for shelter of equipments and batteries.
(v) Fixing arrangement for shelves, ARA terminals/wago terminals, fuses and relays etc.
(vi) Fixing arrangement for MCB, high voltage signal transformers etc. will be under taken in -case 300 volts signal feed circuit is required.

13.3.2 Apparatus cases should be painted completely on all sides, also with bitumen at the out side bottom, before fitting fixtures, clamps and wooden boards etc. which also should be painted individually and then the apparatus cases should be fabricated with all fixtures at work shop of the contractor by the contractor, before providing at site.

Item 14. Data Loggers.

14.1 Installation, testing and Commissioning:

The installation of Data logger shall conform to IRS specification No. IRS-S-99/2006, with latest amendments, along with additional requirements as follows:

14.2 All materials & workmanship shall be of good quality.

14.3 Plant & Machinery as per requirement of installation and as per the specification should be available at site.

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14.4 Following documents should be supplied along with the system.
14.4.1 Mechanical drawings of each sub system /rack.
14.4.2 Trouble Shooting Chart.
14.4.3 Installation and Maintenance Manual.

14.5 The tenderer should give number of digital inputs required by calculating the inputs from the list given below.

a) All ECR's.
b) All HR's, HHR's, DR's or equivalent.
c) All point operating relays NWR's, RWR's or equivalent.
d) All point indicating NWKR's RWKR's or equivalent.
e) All buttons and knob relays.
f) All track and axle counter relays.
g) All timer repeater relays.
h) All timer repeater relays.
i) Intermediate interlocking relays which tenderer need to monitor through data logger e.g. UCR, ASR, JSLR etc. or equivalent.
j) All relays related with emergency operation e.g. route cancellation, overlap cancellation, point operation under emergency, crank handle release, gate release etc.
k) CH, GF, LX release and indication relays.
l) All relays related with block instruments with or without axle counters and SM key.
m) Any other requirements as per the Zonal Railways practice / RDSO guidelines/Instructions.

Or any other relay required to be monitored, and shall obtain approval of engineer. Similarly he will give details of Analogue inputs to be monitored in local area by calculating the inputs from the following list or any other inputs required to be monitored, and shall obtain approval of engineer.

Type of input	No. of channel required.
230 V AC	
110V AC	
12 V AC	
110V AC	
60 V DC	
24 V DC	
18 V DC	
12 V DC	
Axle counter evaluator	

input voltages (RX) (Unit wise)	
Any other voltages.	

Or

As specified by engineer at site.

14.6 In case where RTU is required for monitoring of the equipments at distant place, no. of digital and analog inputs required in RTU, details of analog inputs to be monitored from RTU should be given in the format as given below.

Type of input Digital/Analog	Number of Channels	Approximate distance from data logger

14.7. The tenderer should give Exception Reports (other than those mentioned in Para 5.6 of specification) to be generated and the first of function (In addition those mentioned in Para 3.10 of specification) to be monitored.

14.8. At the station provided with central panel/end panel/lever frame operated MACLS, data logger shall be provided in relay Room /another room near relay room, at a place specified by the engineer.

14.9. For purpose of connection of data logger with central monitoring unit, the data transmission shall be through OFC dropping at such stations.

14.10. Data loggers at one section, if more than one, shall be connected in tandem and the last one to be known as main data logger shall be connected to central monitoring unit through OFC omnibus channel.

14.11. Ten pair PIJF cable laid between two data loggers at one station /or between main data logger and the OFC cable hut shall be terminated at 10 pair CT box provided with Crone connector as per schedule.

14.12. The connectivity of data logger to OFC shall be arranged by Railway.

14.13. The contractor shall connect data logger on the cable so laid upto OFC and after obtaining connection with OFC and the cable laid between the data logger and OFC shall ensure functioning of system network from each station to central monitoring unit.

14.14. The power supply for the system shall be derived from IPS/Battery Bank provided with a battery charger as available at the station.

14.15. All digital and analog inputs shall be derived and terminated at termination board before being connected to data logger.

14.16. Connection between all digital and analog inputs to data logger, data logger and modem and modem to ten pair CT box shall be made using same wire which is used for interconnection between relays in the relay room, except where couplers are provided as a part of data logger equipment.

14.17. All the necessary equipment/ inputs/ resources, considered vital for successful commissioning of the work shall be provided by the contractor within the framework of this tender schedule without additional cost.

14.18. The contractor shall supply the following document free of cost.

(i) Operation manual of data logger/FEP/FAS. 3 copies

(ii) Technical manual of data logger / FEP giving complete circuits details, software details and flow charts, component details /PCB layout etc. — 3 copies

(iii) Trouble shooting procedure/debugging and fault rectification pamphlets for FEP/data logger. — 3 copies

14.19 The contractor shall provide detailed technical training regarding fault tracing/ card level maintenance, programming etc. to six Rly. Supervisors at his factory premises, at his own cost (Rly. shall provide for lodging/ boarding of its supervisor). Additionally hands on training in operation of FEP/FAS, debugging, program editing/database management and system reconfiguration etc, shall be imparted by the contractor, at site to 30 Railway supervisors/ maintainers. Both the training should be fully supported by full literature on testing and fault procedure and testing points.

14.20 The contractor will connect remote terminal unit data logger with the main data logger at end panel station cabins through cable laid for the purpose in between the two and ensure complete data transmission between remote terminal unit and main data logger.

14.21 Central monitoring unit shall be installed at the place in control office /Test room as specified by the engineer.

14.22 4 quad/ PIJF cable shall be laid as per schedule of quantities between OFC cable hut and CMU. The cable shall be terminated on CT box provided with Crone connectors. CT box with Crone connectors to be supplied by contractor.

14.23 Connectivity between CT box and OFC in the cable hut shall be provided by Railway.

14.24 Power supply for CMU and FEP shall be provided through UPS (to be supplied by Railways).

14.25 The entire system shall be net worked and tested with CMU.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

ITEM 15. TRACK DETECTION UNIT AND ELECTRONIC JUNCTION BOX.

The track devices and EJB supplied along with the axle counter as per RDSO specification (as mentioned in schedule) shall be installed as per manufacturer's instruction manual and Zonal Railway practice.

ITEM 16. Universal Axle Counter

Universal axle counter as per RDSO specification No IRS:S-42/85 and Drg No. S-15602-04 with latest amendment shall be installed as per manufacturer's instruction manual and Zonal Railway practice.

ITEM 17. Signal equipment.

(i) Fixing of CLS surface base bolting on the foundation, erection of CLS post with signal unit on to the top or on an offset bracket and fitting ladder & guard to the post at the top and concreting ladder base embedded into the ground and with supporting brackets in the middle, blanking of ladder for distance of one ft. between the height of the 6' 9" and 7' 9" from the rail level by M.S angle and M.S. Sheet of 0.6 mm thick wherever required and termination of cables. This includes provisions of wooden (Sal) cross arm 1 m X 1 m for CLS unit prior to commissioning.

(ii) Fixing of LED lamp unit, current regulator and preventive alarm indication unit and hoods on CLS unit, wiring and focussing the CLS unit.

(iii) Fixing of shunt signal surface base, bolting on to the foundation, erection of shunt signal post with signal unit, termination of cables. This includes provision of wooden (Sal) cross arm 1 m x 1m on signal unit prior to commissioning.

(iv) Fixing of LED lamp unit, current regulator and preventive alarm indication unit and hoods on shunt signal unit, wiring the shunt signal unit.

(v) Fixing of root indicator on top of the signal post or an offset bracket including fixing of offset bracket.

(vi) Fixing of LED lamp unit current regulator and preventive alarm unit and hoods, connecting cable, wiring and focussing route indicator.

(vii) Elevation and distance of foundation from track shall be in accordance with the 'schedule of dimensions' for Indian Railways published by Govt. of India and approved drawings.

All items for the above work, except Rly. supply items mentioned in Vol -I (Annexure) shall be supplied by the contractor including but not limited to the following items: -

(a) "U" bolt for offset brackets.
(b) Wooden cross Arms 1 m x 1m.
(c) M S angle and M.S. sheet for blanking of ladders.

ITEM NO.18: Drawing

The drawing shall be prepared with CAD system and shall be supplied on good quality of paper on the following sizes:

(I) **A3 size - 297 mm X 420 mm: -** For interlocking table, circuit diagram and other field drawings except cable route plan and cable coreage chart which will be in same size as interlocking plan.

(II) The contractor shall furnish two sets of print out of complete wiring diagram and all other drawings for checking. One set will be returned by Railway after checking then on the basis of checked diagram the contractor shall furnish three copies of print out of complete wiring diagram and all other drawings prepared/ modified by them for each station/LC to Railway for approval. After approval contractor shall supply compact disk (CD) in two sets bearing all approved wiring diagram & all other drawings prepared / modified. The contractor shall also supply completion drawings on polyester tracing film double matte, 75

microns thick Garware brand or similar along with 6 sets of print out. The drawings shall be kept in folders with spiral coil binding having transparent plastic cover. The drawing shall be prepared as per Railway practice, SEM, RE Manual, General and Subsidiary Rules and as per latest rules prescribed by Railway.

The drawings / diagrams to be supplied are listed as follows:

(i) Wiring diagram.
(ii) Relay rack chart.
(iii) Terminal and contact analysis.
(iv) Cable route plan.
(v) Cable coarage plan / chart.
(vi) Track bonding diagram.
(vii) Power supply arrangement.
(viii) Apparatus case wiring plan.
(ix) Cable insulation test report.
(x) Track circuit test card.
(xi) Signal Lamp/LED register.
(xii) Battery history card.
(xiii) Equipment disposition plan.
(xiv) Circuit route termination chart.
(xv) Fuse analysis chart.
(xvi) Square sheet.
(xvii) Cable termination chart.
(xviii) Earth resistance chart.
(xix) Polarity chart.
(xx) SWRD

(III) In addition to above following drawing shall also be given by the contractor:

A. Specific to MACLS station with lever frame.

1. Interlocking table
2. Dog charts

B. Specific to MACLS station with panel interlocking.

1. Route section plan.
2. Operating cum Indication Panel diagram.
3. Selection Table.

(IV) Track bonding diagram should be got approved by contractor from S&T project in charge before physical execution at site.

(V) In case where SSI system is being provided Boolean version of wiring diagram shall also be prepared along with conventional wiring diagram.

ITEM NO.19: Technical details for installation and commissioning of IPS:

1. Installation:

a. Panels and batteries shall be placed in suitable configuration to suit the site.
b. There shall be a minimum clearance of 700 mm on rear side of panels and minimum 1000 mm from front side of panels.
c. The minimum rear clearance for batteries should be approximately 500 mm.
d. The battery shall be kept as near as possible to SMR panel, less than 20 meters. It also should be ensured that all the other external cable lengths are also as minimum as possible to reduce cable drops. This cable, along with ladder and other sub ordinate arrangements etc. shall be laid by the contractor /Railways executing MACLS work at the station.
e. All the cables and wires used for wiring and inter connections of modules shall conform to specification No. IRS: S 76-89/IS 694 of grading 1100V. Aluminium wires shall not be used. The gauge of wiring shall be such that the current density does not exceed 3 amperes/mm square in terms of RDSO specification no. RDSO/SPN/165/2012. Cable required from IPS to relay room for various supplies will be supplied by contractor. Power cable required from auto changeover panel to IPS will be supplied by railway. All the cable will be laid by contractor to make the system functional. Fixing arrangement for exhaust fan (exhaust fan will be supplied by IPS supplier) is to be done by contractor along with material required.
f. Scope of works between contractor and IPS supplier shall be governed by D.G./Signal/RDSO letter No. STS/E/IPS/Genl. Dated- 03/04.04.2008.

2. Testing and commissioning (General):

a. The input voltage and frequency for their limit of 160 – 270 volts and 50 Hz +/- 2 Hz shall be tested.
b. Each module viz. SMR, AC distribution panel, DC distribution panel, ASM's indication panel and inverter etc. shall be commissioned and tested.
c. The total system shall not be switched on for its operation and the batteries shall not be connected until sub modules of whole IPS system are installed and commissioned.
d. All switches and circuit breakers shall be kept in OFF position and all cables shall be connect to the system.
e. It shall be ensured that all the earthing terminals of all panels/modules are connected to proper earthing.
f. All cable connections as laid by the MACLS contractors/Railways from relay room of equipment/battery room shall be connected to the IPS keeping circuit barkers off.

3. Final testing & commissioning of IPS:

a. Connect battery to SMR panel while keeping off switches in all conditions.
b. Switch on mains. Switch on SMR module/Inverter/DC-DC converters/ magnetic sequentially.
c. Connect all loads to the system sequentially.
d. Check for full state of change of battery.
e. Allow the system to remain on AC mains till booster indication disappears.

f. Switch off AC mains and allow battery to discharge to desired level, observe for alarms test for load bearing time.

g. Switch on mains allow battery to reach full state of charge.

4. Record:

The contractor shall prepare a record of all tests conducted and hand over the same to Railways in form of a register neatly printed.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

ITEM 20. Commissioning of EI and associated equipment/system.

20.1 The EI system shall be supplied and installed in conformity to RDSO specifications No. RDSO/SPN/192/2005 with latest amendments and having Hot standby system configuration.

20.2 Any alteration in the interlocking plan to be done during the course of execution of this work shall be carried out by the contractor expeditiously without any extra cost, wherever additional equipment is not required. In case of increase/change in quantity of equipment, design & circuit alteration shall be done without extra cost whereas additional equipment cost may be paid.

20.3 The supply of materials shall be as per schedule of quantities of work. This includes supply of EI equipment complete with all sub systems like CPUs and all the requisite cards of the EI system, necessary interface equipment with field signalling gears, electronic field interface equipment/object controller for interface with the field signalling gears, maintenance terminals with VDUs, keyboards and printers, operator panel interface etc, required to make system functional.

20.4 The interface equipment/ device to the field signalling gears and control panels should be complete and compatible with the signalling equipment, in use for Relay Interlocking on the stations. Any equipment/ work required to make the interface equipments match with outdoor signalling equipment shall be without any extra cost. Railway will not undertake any change in outdoor signalling equipment, nor shall bear any extra cost on account of changes/addition required for ensuring compatibility of interface devices with outdoor signalling equipment.

20.5 The operations of all field gears are done from one control cum indication panel / Video terminal as per specification IRS–S-36/87 with latest amendments provided at a central place at the station. The EI system should be able to interface to this panel and provide electronic interlocking in accordance with Selection table in a failsafe manner.

20.6 Supply of technical literatures, documentation, drawings & completion plans etc:

a. The supply of equipment and materials shall include supply of printed documents from the original equipment manufacturers with each equipment. The documents should include all software documentation required for the equipment.

b. Except where printed documents are supplied with each equipment by original equipment manufacturer, all other documentation and information shall be prepared using CAD. All the documentation and drawings etc. shall be supplied in two sets of CDs. The drawings etc. shall also to be supplied in duplicate on J.K. Copier/Map litho white paper to facilitate taking out copies on plain paper copier. In addition four complete sets of such documents shall also be supplied for ready use duly bounded in good plastic folders.

c. The supply of equipment and materials shall also include necessary documentation related to training on the maintenance of equipment in sufficient number of copies and one VCD to the extent specified elsewhere in this agreement.

20.7 Training:

20.7.1 The contractor shall provide adequate training at the manufacturer's premises to Railway personnel in planning, design, installation, operation and maintenance of the equipment and system supplied under the contract.

20.7.2 The tenderer shall undertake to train Railway personnel nominated by CSTE/CORE in different aspects of equipment design, functioning, installation, testing, commissioning operation, maintenance and repair, covering both hardware and software. The training should be comprehensive so as to impart full knowledge to Railway personnel deputed for the training to independently execute the installation, operation, maintenance and repair of all equipment. The training course should, apart from formal class room training include hands on practical experience and visits to working installation. The training shall normally be at the manufacturer's premises or as decided mutually between the Railway and the Contractor.

20.7.3 The cost of all travel to and fro the place of training boarding and lodging of the trainees shall be borne by the Railways.

20.7.4 The requirement of training in man-months has been indicated in the schedule of work. The tenderer shall quote for the man month rates and Railways shall have the right to vary the training period indicated in the schedule of work.

20.7.5 In the event of any equipment/sub-system being manufactured in India. in technical collaboration with foreign firm by the tenderer or any of its sub-Contractor, approximately half of the training provided in the schedule shall be arranged at the collaborator's premises/training centre and the remaining portion at the working installations. Details of training proposal shall be submitted by the tenderer.

20.7.6 Set of documents related to training shall be provided in adequate quantity.

20.8.1 Scope of work will also include supply, installation, testing and commissioning of all Indoor works as per schedule of works and as per practice prevalent in Northern Railway.

20.8.2 The scope of work will also include all types of works including minor Civil Engineering as well as supply, trenching, laying, termination of indoor/outdoor cables required for interconnection of EI/SSI System with Control-cum-indication Panels, etc. The tenderer should therefore, ascertain the type of topography by conducting survey as no extra cost shall be allowed on this account subsequent to the award of contract. All other works inside the building shall be done (i.e. connection of cables from EI/SSI to Power room and power room to panel room) by the contractor taking due care. No material would be supplied by the Railways for any of the above.

20.9 Installation, testing and commissioning:-

The installation of the equipment including software loading and required data input etc. will be done by the OEM (Original Equipment Manufacturer). Testing and commissioning of EI/SSI system will be done by the OEM jointly with Railway Engineer at site. The Contractor shall have an MOU with OEM for Installation, testing and commissioning and for deputing his competent Engineer and qualified staff for the same. The Contractor shall submit a detailed installation and commissioning Test Schedule for Railway’s approval and full record of tests conducted shall be maintained by the Contractor and handed over to the Railway along with the installation.

20.10 The tenderer shall undertake study / survey of signalling systems / practices used in Northern Railway and make his own arrangement of the interlocking work involved in integration of the indoor equipment with outdoor equipment so as to make the entire system successful / functional. Any equipment / design / component needed will be supplied by the contractor without any extra cost.

20.11 The tenderer shall have adequate telecom. facilities, computer and data network facilities, transport arrangement, construction machineries, tools and plants etc. for smooth execution of the project in addition to those mentioned in para 19.0 of Volume II, Chapter I.

20.12 INSPECTION AND TEST:-Inspection and test shall be carried out by RDSO.

20.13 RELIABILITY.

Reliability is of paramount importance for EI systems being installed over high-density, high-speed routes. MTBF and MTBWSF figures for the whole EI system based on statistical evaluation should be indicated.

20.14 SPARES

20.14.1 The following materials will be considered as essential spares:

All units which include, circuit packs/boards/card file, modules/cards, terminals, power supply modules, ancillary equipment, interconnecting couplers/ connectors/cables of each type, which may be lowest level of field replaceable module/assembly/device-10% of the quantities used in the equipment subject to a minimum of one of each type. For any other essential spare / module / assembly / device needed, but not included by the contractor, the supply of the same will be made by the contractor, at his cost to the Railway.

20.14.2 The tenderer shall include in his tender the details of essential spares, their quantity and unit prices as per schedule of works. Detailed explanation to confirm that quantity of spares quoted as per requirement of this clause shall be furnished. The total cost of essential spares based on the unit prices quoted by the tenderer shall be included in the tender evaluation.

20.14(A)Work station: The tenderer shall also indicate in his offer, the details of laptop based work station for data input and configuration, simulation and functional testing, diagnostic and trouble shooting and commissioning etc. of EI system.

20.15 MANUFACTURER IN INDIA

20.15.1Tenderer shall make the following facilities either through Indian partner as a joint venture or directly by themselves.

a. Facilities for application program/yard specific data input changes commensurate with any changes in the station yard layout.

b. Maintenance, Repair, servicing and testing of defective cards/ modules/sub assembly of the EI system quoted in this tender.

20.15.2 Technical collaboration: The tenderer shall submit along with his offer full details of technical collaboration/MOU for maintenance, repair, servicing, testing including application programming for yard specific application of the offered Electronic interlocking equipment in India acceptable to the Railway.

It shall also include continuous flow of technology improvement/future up gradations.

20.16 LONG TERM AVAILABILITY OF SPARES AND SYSTEM SUPPORT

20.16.1 The tender shall give an undertaking to supply on payment all maintenance spares and tools required for the equipment during life time. He shall also undertake to supply additional equipment required for replacement of expansion of the network that may become necessary due to additional traffic requirements. The price variation formula adopted in pricing such maintenance spares and additional supply that may be ordered in future shall be provided by mutual discussions.

20.16.2 The manufacturer shall guarantee that spare parts for the system shall be available for a minimum period of 8 years after acceptance of the system. At least two year notice shall be given to the Railway before any equipment or components are discontinued or phased out from the manufacturing plans. This will enable the Railways to assess the life time requirement of spares needed and order in sufficient quantity prior to stoppage of the manufacturing.

20.16.3 The successful tender shall further guarantee that in case if he goes out of production of spare parts, he shall supply the full manufacturing drawings/ details along with the specifications of the materials at no cost to the Railway, as and when required for the equipment to be fabricated or procure from other sources by the Railway.

20.16.4 The supplier shall recommend and provide, prior to the system acceptance, calibration procedures. The recommendation shall include a list of the various calibration instruments, recalibration periods and extent of preventive maintenance for each test instrument.

20.17 QUALITY ASSURANCE & SOFTWARE VALIDATION

20.17.1 The tenderer shall submit along with the tender the quality assurance control, and inspection plan including full details of in-house quality assurance organization, procedure and documentation. During the manufacturing process, proper record shall be maintained for the inspection and tests carried out according to this plan.

20.17.2 In the event of Railway waving off the inspection, all tests provided in the test schedule approved by Railway shall be carried out by the quality assurance organization and proper record of all such tests and results thereof shall be maintained and supplied to the Railway on demand.

20.17.3 The tenderer shall submit along with this tender the details of software validation done by an Accredited Agency of international repute and standard. Further all the details of test, certification and validation done to

ensure full safety of the system for use at stations for operation of passenger train services as per the technical specification, shall be submitted by the tenderer.

20.18 COMMISSIONING AND FINAL ACCEPTANCE TEST

20.18.1 Railway shall carry out all tests as per the technical specification and the acceptance test schedule as furnished by the contractor and approved after consultation by the Railway. The test schedule furnished by the tenderer will be modified by mutual discussions between the contractor and the Railway before finalization. Any component modules, sub- assemblies or equipment failing during the commissioning test shall be replaced/ repaired free of cost by the tenderer.

20.18.2 All tests and measuring instruments and other arrangements required for final Acceptance test shall be provided by the contractor at his cost.

20.18.3 The completion certificate in accordance with General condition of contract, technical specification and special condition of contract shall only be issued by the Railway Engineer after the installation is satisfactorily commissioned.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

Item No. 21 Prewired Relay Racks and Cable Termination Board.

21.1 Composite Relay Rack shall be fabricated & supplied as per Drg. No. CORE/S&T/ ALD/SK/ 504/2001 and fixing arrangement for neutral plug in relays ‘Q’ Type, lamp-proving relays etc. Fixing arrangement for fuses and Terminal block M6 (ARA Terminal/ wago terminal) etc. should be in conformity with the Drg. No. CORE /S&T/ ALD /SK/504/2001 and SK/DRD./OL/109. Alt. A Hylam sheet size 1100 mm x 900 mm x12 mm shall be provided in Relay Rack for fixing of Terminal block M6 (ARA terminals/ wago terminal).

21.2 The complete relay rack shall be wired in conformity to the approved wiring diagram, tested and installed in the relay room. The same shall be offered for testing to the Engineer & any corrections in the wiring carried out or and any changes that may be brought out by the Engineer shall be carried out by the contractor at no extra cost. The wires connected to the terminals shall be soldered. It shall be ensured that there is no dry soldering.

21.3 Composite relay rack large shall be fabricated & supplied as per Drg.No. CORE/S&T/ALD/SK/503/2001 and fixing arrangement for neutral plug in Relays ‘Q’ Type, lamp proving relays etc. Fixing arrangement for fuses and terminal block M6 (ARA terminal/ wago terminal) etc. should be in conformity with the Drg.No.CORE/S&T/ALD/SK/503/2001 and SK/DRD/OL/109. Alt. A

Hylam sheet size 1100 mm x 1280 mm x 12 mm shall be provided in Relay Rack for fixing of Terminal block M6 (ARA terminals/ wago terminal).

21.4 The complete relay rack shall be wired in conformity to the approved wiring diagram, tested and installed in the relay room. The same shall be offered for testing to the Engineer & any corrections in the wiring carried out or and any changes that may be brought out by the Engineer shall be carried out by the contractor at no extra cost. The wires connected to the terminals shall be soldered. It shall be ensured that there is no dry soldering.

21.5 Supply and fixing of Main Cable Termination Board as per Drg No. CORE/S&T/ALD/SK/505/2001 along with fuses and fuse bases. Fixing of ARA terminals /wago terminal /'I' type transformer and termination of outdoor cables. Hylam sheet size 1296 mm x 900 mm x 12 mm shall be provided on Main Cable Termination Board for fixing Terminal Block M6 (ARA Terminals/ wago terminal). ARA terminals/wago terminals supplied through other schedule shall be used here.

21.6 Prewired Relay rack shall be fabricated & supplied as per Drg. No. CORE/S&T/ALD/ SK/597/2013 and fixing arrangement for neutral plug in relays Q' type, lamp proving relays, point groups, tag blocks etc.

21.7 Contractor's shall provide anti tilting arrangement for shelf type relays. (Ref Drg no. NBRE/SIG/GEN/050).

Item No. 22 Wiring of SM's Slide Control Frame.

Fixing of terminal block M6 (ARA terminals/wago terminals) on 6 mm thick Hylam sheet in SM's slide box/ terminal board and wiring as per approved circuit diagram. This includes supply of all materials except ARA terminals /wago terminals which is separate supply item.

Item No.23 Installation of ground lever frame and boom locking.

23.1 Installation of all fittings i.e. ground lever frame, point rodding, guide roller assembly, solid joint, crank, compensators, casting, concreting & curing of foundation for A & B type foundation shall be done in conformity to Drg. No. RE/S&T/Sig/ Tender/SK/11/85. Fixing of cranks & compensators on A & B type foundation and rodding should be connected with necessary solid joints wherever required with forge welding.

23.2 Boom locking shall be installed in conformity to RDSO Drg. No.SA 7998/M. Point rodding shall be used for boom locking instead of flexible wire shown in the drawing.

23.3 Running of point rodding required for boom locking shall be on trestle placed at 2 mtrs. Interval along with the provision of roller pin and split pin, maintaining a minimum of 30 cm. distance between nearest rod joint from the trestles. Trestle should be embedded in the earth fully on all side upto the top of trestle.

23.4 Foundation for ground lever frame shall be casted in conformity to drg. No.RE/S&T/Sig/Tender/3/85.

23.5 It shall be ensured that boom locking is effective and it is not possible to lift the boom by more than 10 degree from closed position.

23.6 Wherever, it is required for the rod run to cross the level crossing gate, arrangement shall be made as per Drg. No. CORE/S&T/ALD/SK/553 /2003. A trench shall be made across level crossing gate of width just enough to accommodate trestles. Trestles shall be provided in the trench along with standard roller guides, top & bottom rollers such that rod is run at minimum clearance of 25 mm from bottom of the plate. Two 'H' channels shall be placed across the road on both sides of the trench such that the top of channel is flushed to the surface of the road. The work shall be carried out causing lest interruption to road traffic.

Item No. 24 Locking of SM's slide control frame.

24.1 A locking table & dog chart for slide frame specific for the station shall be prepared & approval shall be obtained from the Engineer.
24.2 Tappets shall be fabricated & notches in slides be cut in conformity to the dog chart so approved.
24.3 The locking shall be provided by riveting the tappets to M.S. bridle bar, such that slide does not move more than 1 mm. when locked.
24.4 One channel of the S.M's slide frame shall be used for locking all slides by S.M's lock.

Item No. 25 Installation of lifting barrier.

25.1 Lifting barrier shall be installed in conformity to RDSO Drg No. SA/7986/M (R.H.) & SA 7994/M (L.H.) suitable for 6 mtrs. Long gate.
25.2 Foundation for pedestal shall be casted as per drawing No. CORE/S&T /ALD /SK/552/2003.
25.3 The boom rest (stop post) shall be in alignment with the boom.
25.4 The boom shall be provided with 300 mm bands alternate black & yellow colour of approved type of retro reflective strips. The stop board shall be painted with fluorescent red paint with word 'stop' painted white in the center. The fringes, if provided, shall also be painted with fluorescent yellow paint.
25.5 It shall be ensured that while closing the gate, warning bell rings and lamp brackets also get turned to give red indication to road users when closed & white, when gate opened.
25.6 The wire rope shall not overlap at the winch and rope drums. The guy rod shall be given sufficient tension for smooth operation of the boom & painted with black enameled paint.
25.7 Oil holes, grease nipples etc. provided with spring-loaded covers shall be filled with grease.
25.8 It shall be possible to extract the key from the winch only when the gate is fully closed.

Item No. 26: Installation of Road Signal & audible warning bell.

26.1 Foundation for Road signal shall be as per Drg.No.RE/S&T/Sig/Tender/ SK/1/85 and as per technical specification No. 2 of enclosure-I.

26.2 Signal on both side of the L.C.Gate shall be provided as per technical specification No. 17 of enclosure-I.(covered under other item of schedule).

26.3 A standardized audio dual tone warning bell with 20 W horn and 15 W amplifier shall be provided for warning to approaching traffic while closing the gate. Power Supply to be provided by Railways.

Item No. 27: Installation & commissioning of Axle detectors, field units of Single /Multi Section Digital Axle Counter.

27.1 Axle detectors shall be installed at locations specified by the engineer.

27.2 High frequency Axle detectors shall be installed in conformity to the provisions of specifications number RDSO/SPN/177/2003 (version-1.0) or RDSO/SPN/176/2005 (version-2.0) with latest amendments and manufacturers installation procedure.

27.3 Any work to be done on the rails, such as drilling holes in the web of rail, shifting of sleepers associated with any disturbance to existing track fittings/ rails shall be done in presence of representative of Railway only.

27.4 Different frequency shall be used for each set of transmitter & receiver coils.

27.5 Double wall anti rodent corrugated pipe of 90 mm outer dia. shall be used in conformity to specifications number IS -14930, Pt. II.

27.6 The trench to lay the cable connecting axle detectors to Field unit shall be one meter deep from the rail top & 150 mm dia. wide (minimum) and the cable passing through the Double wall anti rodent corrugated pipe should be laid in the trench. The trench should be refilled & brought back to its original position, properly rammed including restoration of ballast after laying the cable.

Both the end of Double wall anti rodent corrugated pipe should be properly closed & sealed, one end terminating in the apparatus case connecting field unit.

27.7 Deflector required for the protection of axle detectors shall be fabricated out of 10 mm thick M.S. Steel plate of suitable size so as to properly protect the axle detectors & not to infringe with the schedule of dimensions shall be mounted on rail web with nuts & bolts/clamped with the rail flenge to protect axle detectors against the damage from hanging parts of moving train. The rail deflector should be mounted on both sides of the fitting next to the axle detectors, about approx. 300 to 400 mm away.

27.8 The half apparatus case as provided by Railways/procured through other item of supply shall be fabricated with M. S. Angles etc, Sal wood board shelf , hylam sheet, fixing ARA terminal/ wago terminals, fuses and fixing of relay bases by cutting suitable slot in the hylam sheets as per instruction of Engineer, in conformity to drawing no. CORE/ALD/SK/551/2003 dated 13.11.2003 & shall be fixed on already casted foundation for the same through nuts & bolts. The apparatus case shall be painted in conformity to the provisions of said drawing before fixing on the foundation.

27.9 The Field unit along with vital relay box (wherever required) shall be placed & secured through clamps, nuts & bolts on the shelf.

27.10 In case any one of the axle detectors is used as axle detectors for track section of the yard as well as to be used as axle detector for block proving by axle counter, suitable wiring arrangement should be done accordingly.

27.11 The lead wire coming from axle detectors, the power cable, 4 quad cable connecting central evaluator to field unit shall be terminated in the apparatus case & complete system including field unit & axle detectors shall be wired, commissioned & tested in all respects.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

Item No. 28: Installation of Multi Section Digital Axle Counter central evaluator along with resetting arrangement.

28.1 The central evaluator shall, field units & axle detectors etc complete system, be installed in Relay room/ any other room specified by engineer in conformity to the provisions of RDSO specification no. RDSO/SPN/176/ 98 with latest amendments and manufacturer installation procedure. In case of any deviation between the two, RDSO specification shall prevail. Copy of RDSO specification is enclosed as annexure II to this supplement.

28.2 Number of modules each consisting upto 8 detection points shall depend on detection points required to be provided in the yard. One central evaluator may contain five such modules thereby shall support 40 detection points & 35 track sections. The central evaluator shall connect to Digital Axle Counter Field Units in star configuration.

28.3 The power supply to the system shall be provided from IPS. For connecting power supply from IPS 3/075 mm single core cable to IS specn. no. IRS-S-76/89 with latest amendments shall be used. Wiring should be done through PVC casing-capping. If more than one power supply is required to be brought between axle counter rack /MSDAC evaluator the termination of power supply / MSDAC evaluator shall be decided by Engineer. In case more than one power supply for evaluator or for connecting two power supply for feeding power to axle detectors, each shall be on a independent pairs of wires passing through an independent PV casing.

28.4 The connections from all axle detectors shall be made between cable termination rack for field unit & central evaluator shall be made using pet insulated multi core cable/single core cable in conformity to the manufacturer installation procedure. The wiring/cable shall be supported on a ladder arrangement similar to provisions of technical specification of enclosure I, item no.7(III) & dressed.

28.5 The contractor shall prepare axle detectors plan in conformity to the SIP of the station, clearly defining track section & obtain approval of Engineer. He

will field configure the central evaluator in accordance with the track sections/axle detectors plan so approved.

28.6 In case any one of the axle detectors is used as axle detectors for track section of the yard as well as to be used as axle detector for block proving by axle counter, suitable wiring arrangement should be done accordingly.

28.7 Structure for placing Reset unit shall be fabricated of angle iron frame of 45 x 45 x 5 mm to be grouted with the ground & painted with black enamel paint at a place to be decided by Engineer. The frame shall be covered with a Sal wood top of size 1000 x 500 x 20 mm, side edges of the board shall be rounded off, fine finished & spirit polished. The Reset unit shall be placed on the Structure so fabricated & wired in conformity to manufacturer installation procedure.

28.8 Verification boxes shall be provided on wall of station building / at any other place considered appropriate by Engineer from where the concerned track section is clearly visible to the person operating the switch. For this a 30 x 30 x20 mm Sal wood board shall be prepared, side edges of the board shall be rounded off, the board shall be fine finished & spirit polished. The board shall be fixed / mounted on the iron clamp with nuts & bolts, using iron flat clamps grouted in the wall. In case more than one verification box is required to be fixed at one place the size of the Sal wood board shall be suitably increased. The wiring has to be done with 16/0.2 wire on the terminals provided in the line verification box. Care has to be taken that all the line verification box keys are of separate wards. For easier identification, axle counter number should be painted on line termination box so that in case of failure of axle counter, particular axle counter only be resetted.

28.9 All the verification boxes shall be wired & connected resetting system concealed through 20 mm PV tubes supported at regular intervals not exceeding 1 mtr. by steel clamps fixed to the wall with sal wood pegs, from start to end. The wires from each verification box should be run through independent PV tube. It should not be possible under any circumstances to have an access to the wiring without tempering with the concealment arrangement.

28.10 Entire MSDAC system provided at station shall be checked for accuracy of track section configuration, operation of each vital relay corresponding to associated track section along with complete power supply arrangement out going for field units, evaluator, resetting box and associated equipments and brought to reliable & fail safe condition.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

Item No. 29: Installation of Block Proving by Axle Counter using Single Section Digital Axle Counter & MUX for single/double Line Section.

1. Installation of Axle Counter, multiplexer should be done on suitable bolts grouted on 70 x 60 x 15 cm (approx.) CC platform for each or on 4 nos. std. design tripods for each with std. insulation on same.

2. Supply & Installation of CT rack should be done as per drg. No. NR/S&T/Con/4.1/97-A. Supply & fixing of necessary fixtures, M.S. flats, angles, 6 mm hylam sheet, 8 way PBT strips (drg. No. SA 24811, spec. No. IRS-S-79/92 or latest), bus bars, fuse block with fuse links should be done suitably.

3. Krone or weather proof DP (50 pair, 2 Nos. per station) should be supplied and suitably mounted on walls in SM's room. Internal wiring between CT rack/ MUX/ evaluator etc. should be done as per approved circuit diagram. This also includes termination of cables/wires of Block Instrument of Relay rack, dressing, bunching and ladder (150mm x 3mm) arrangement for supporting wire runs.

4. Supply & fixing of HDPE pipe with elbows and T-points between MUX and evaluators, between SM's room panel and DP on the wall, termination of CT rack side cables and SM's panel, coupler cables in the DP box with lugs, re-plastering of floor/walls to the original condition, drilling holes on hylam sheet to bring cable cores on 8 way strips / M-6 terminals, supply & fixing of suitable MS ladder adjacent to CT rack, bringing the cables through the ladder to CT rack, termination of cables with suitable lugs, dressing/ bunching of cables in relay room, fixing of relay bases, complete wiring in axle counter room/ SM's office as per wiring diagram to complete the circuits to commission axle counter block system as per drg. No. S-32010 with latest modification.

5. Multi strand 16x0.02 flexible wire shall be used for metal to carbon relays & other wirings. Indoor cable required, twin twisted screen / shielded cable, wires, connectors, lugs & bolts, soldering materials etc. shall be supplied by contractor. Drawing the indoor cable from CT rack to SM's panel room through suitable MS ladder/ PVC/HDPE pipes shall be done by the contractor with his own labour & materials such as indoor cables, MS ladder, PVC pipes, HDPE pipe & sundry, fixing material. However, where signalling / telecom cables are required to be laid either due to being laid underground or due to distance consideration the same shall be supplied by the Railways/ drawing/ laying of the same shall be done by the contractor with his own labour & materials. The MS ladder / racks etc. shall be insulated suitably. This also includes any other things required for installation & commissioning of relay room & SM's room equipment.

NOTE: - Refer item No. 32 of Technical specification enclosure-I for compliance of OEM Certification for the installation before Commissioning.

Item No. 30: Maintenance of SSI.

30.1 After the equipment has been commissioned & placed in service and provisional acceptance certificate issued by purchaser's Engineer, the Contractor shall be responsible for proper maintenance, supervision of the equipment for a ***period of 12 months*** from the date of commissioning. For this purpose he shall prepare a maintenance plan and make available the services of qualified maintenance Engineer stationed at the location approved by purchaser's Engineer who will guide and supervise the work of Railways maintenance staff. The maintenance Engineer of the tenderer will visit all the stations at least once in a month and attend to any fault on the systems.

30.2 During this period of maintenance supervision if any lacuna is noticed in the functioning as a result of any defect in design or manufacture, the same will be rectified by the Contractor free of cost. During such rectification if any faulty equipment/modules need replacement or repair, they shall be provided by the Contractor from the set of equipments or modules that the Contractor should bring to the site of installation in addition to all the materials to be supplied against this contract. Use of spare modules covered under the schedule of material of this tender shall not be permitted to be used during installation, commissioning and maintenance supervision period without personal approval of purchaser's representative. Spares, so issued under unusual circumstances, should be replaced by the firm within seven days of the issue of spares.

30.3 The contractor shall ensure availability of service maintenance Engineer round the clock in the close vicinity of the station who will keep himself in contact with the Railway staff operating the system round the clock.

30.4 The service engineer shall attend to any abnormal working of EI system promptly on receipt of written/ verbal advice.

30.5 The service Engineers so deployed by the contractor shall under no circumstances interfere with the system unless in presence of representative of Engineer.

ITEM No. 31. Modification/Replacement of Block Instrument to suit 25 KV AC Traction-

Modification / Replacement, **i**nstallation, wiring, testing and commissioning to be done by contractor as per standard circuit diagram to be supplied by Railway. Block Instrument, Block bell equipment, filter unit, polarized relay/relays, battery chargers, block counter, secondary cells shall be arranged by Railway. All other materials, Condensers, Resistors, etc. required for the work shall be supplied by contractor. This includes wiring of battery charger and secondary cells connected to block instruments.

ITEM No.32 OEM Certification for the installation before Commissioning of electronic signaling systems.

In order to ensure that equipment is properly installed and commissioned by adhering to pre-commissioning check-list and procedure as defined by OEM in its installation manual, it is necessary that electronic signaling systems, as defined below, are installed and commissioned by RDSO approved vendor and a certificate is issued to Railways in the given format as Form - II in Volume - I.

(a) EI

(b) SSDAC/MSDAC

(c) UFSBI/BPAC

(d) AFTC

(e) IPS

(f) Data Logger.

ENCLOSURE-II

LIST OF SIGNALLING MATERIALS WITH THEIR SPECIFICATION/ DRAWINGS (ONLY THOSE ITEMS WILL APPLY TO CONTRACTOR, WHICH ARE TO BE SUPPLIED BY THEM.)

1. PVC Insulated armoured Signalling Cable 8/12/20 core 1.5 sq. mm. as per specification No. IRS-S-63/2014, Rev-4 with latest amendments. The core of the cable shall be identified as Para 3.2.6.
2. Jelly filled cables as per specification IRS-TC-41-97 with latest amendment for axle Counter.
3. PVC insulated, PVC sheathed armoured railway signalling power cable, 1100V grade 2 core of size 25 sq.mm H2 grade Aluminum conductor confirming to requirement of IRS-S-63/2014, Rev-4 with latest amendments except for the Aluminum conductor which shall be as per IS-1554 (Part-I) with latest amendments.
4. Four quad having 0.51 mm dia. or 0.9 mm dia. conductors underground cable for Axle counter for use in Railway Electrified Areas as per IRS: TC-30/96 with latest amendments.
5. 3/0.75 mm & 7/0.75 mm Single core cable conductor comprised of annealed bare copper wire PVC insulated (11 mm wall thickness) flame resisting in red and black colour insulation conforming to IRS Specification No. IRS-S-76/89 with latest amendments.
6. 0.6 mm and 1 mm single or multi core indoor wiring cable and 16/0.2 mm single core flexible cable as per IRS specification No. IRS-S-76/89 with latest amendments.
7. Apparatus case steel single as per Sketch No. RE/S&T/ALD/SK/219/82 with alteration ‘A’ and 221/82 with Alteration ‘B’. The key and handle should be @ one each per 4 apparatus cases.
8. Apparatus case steel half as per sketch No. RE/S&T/ALD/SK/220/82 with Alteration ‘A’ and 221/82 with alteration ‘B’. The key and handle should be @ one each per 4 apparatus cases.
9. Junction box steel as per Sketch No. RE/S&T/ALD/SK/227/82 Corrected upto 30.6.86 and 228/82 corrected upto 18.1.83. The key and handle should be @ one each per 4 Junction boxes.
10. Track lead Jn. Box as per RDSO Drg. No. SA-20101/M Complete with 450 mm long 25 mm dia. pipe.
11. Signal Colour Light Multi Unit type 4 aspect without sidelight, signal transformers, lamps and lenses as per RDSO Drg. No. SA-23001 A/M (Adv.) with latest amendment.

12. Signal colour light Multi Unit type 3 aspect without side light, lenses, lamps and signal transformers as per RDSO Drg. No. SA-23002 A/M (Adv) with latest amendment.
13. Signal Colour Light Multi Unit type 2 Aspect without sidelight, lenses, lamps and signal transformers as per RDSO Drg. No. SA-23003 A/M (Adv) with latest amendment. The mounting socket should be provided for 140 mm dia. to RDSO Drg. No. S-23005 M (Adv) with latest amendments.
14. Colour Light Signalling Tubular post 5.6 meters long, conforming to IRS specn. No. IRS: S-6-81 with latest amendments.
15. Colour Light Signalling Tubular post 4.6 meters long, conforming to IRS specn. No. IRS: S-6-81 with latest amendments.
16. Colour Light Signalling Tubular post 3.6 meters long, conforming to IRS specn. No. IRS: S-6-81 with latest amendments.
17. Route Indicator Direction type 5 Unit Arm 1 way as per RDSO Drg. No. SA 23401(Adv.) latest, complete with fittings but without lamps, lenses and signal transformer alongwith mounting sockets 140 mm dia to RDSO Drg. No. S-23005/M (Adv.) latest.
18. Route Indicator Direction type 5 Unit Arm 2 way as per RDSO Drg. No. SA 23402 (Adv.) latest, complete with fittings but without lamps, lenses and signal transformer along with mounting socket 140 mm dia. to RDSO Drg. No. S-23005/M (Adv.) latest (Suitable arrangement should be provided to fix the Arm as per Unit Combination ‘a’ and ‘b’ indicated on the Drg.)
19. Route Indicator Direction type 5 Unit arm 3 way as per RDSO Drg. No. SA 23403 (Adv.) latest, complete with fittings but without lamps, lenses and signal transformer along with mounting socket 140 mm dia. to RDSO Drg No. S - 23005/M (Adv.) latest (Suitable arrangement should be provided to fix the arms as per Unit combination ‘a’ and ‘b’ indicated on the drg.)
20 Ladder for colour light Signal Multi Unit Type 5.5 Meters as per RDSO Drg. No. SA 23156 (Adv) Alt. 1 Latest.
21. Ladder for Colour Light Signal Multi Unit type 4.5 meters as per RDSO Drg. No. SA 23153 (Adv) latest.
22. Ladder for Colour Light Signal Multi Unit type 3.5 meters as per RDSO Drg. No. SA 23150 (Adv.) latest.
23. Signal Base for 140 mm dia. post as IRS (S) Drg. No. S-2011/M latest.
24. Signal Bracket Colour Position Light for 140 mm outside dia. post as per RDSO Drg. No. SA 23080 (Adv.) latest.
25. Offset bracket for CLS for 140 mm outside dia. post procured through Signal Workshop. RDSO Drg. is not available.
26. ‘P’ Marker (Non - illuminated) as per Drg. No. RE/S&T/SIG/Tender/SK /36/ 85 dated 20.4.85.
27. Signal cable Marker as per Drg. No. CORE/S&T/ALD/SK/373/93. Pg.10, ALT.- A.
28. Block Section/Shunting Limit Board as per RDSO Drg. No. SA 2373 (Adv.) latest.
29. Cable Trough (GI) for girder Bridges as per Drg. No. RE/S&T//SIG/TENDER/ SK/22/85 dated 20.04.85.
30. Earth Electrode as per Drg. No. RE/S&T/SIG/Tender/SK/398/94.
31. RCC Pipe 150 mm dia. 2 meter long with collars to IS Specn. No. 458/1971.

32. Signal Shunt Position Light 2 Positions as per RDSO Drg. No. SA 23840. (Adv.) latest.

33. Repeater Luminous Signal Green as per IRS Drg. No. SA 23271 C/M.
34. Repeater Luminous Signal Red as per IRS Drg. No. SA 23271 A/M.
35. Repeater Luminous Signal Yellow as per IRS Drg. No. SA 23271 B/M.
36. Indicator Luminous Stencil Type 'F' as per IRS Drg. No. SA 23296/M.
37. do 'L' as per IRS Drg. No. SA 23295/M.
38. do 'N' as per IRS DRG. No. SA 23291/M.
39. do 'OFF' as per IRS Drg. No. SA 23293/M.
40. Indicator Luminous Stencil type 'ON' as per IRS Drg. No. SA 23294/M.
41. Indicator Luminous Stencil Type 'R' as per IRS Drg. No. SA 23292/M.
42. -do- -do- Case complete as per IRS Drg. No. SA 23297/M.
43. Circuit Controller 2 Way (modified design) lever type as per RDSO Drg. No. SA 20245 (Advance).
44. Circuit Controller 4 Way (modified design) lever type as per RDSO Drg. No. SA 20266 (Advance).
45. Circuit Controller 6 Way (modified design) lever type as per RDSO Drg. No. SA 20276(Advance).
46. Circuit Controller 6 Way (modified design) lever type as per RDSO Drg. No. SA 20286 (Advance).
47. Double wire circuit controller (Rotary Type) 4 way as per Drg. No. SA 22420 (Advance).
48. -do- 6 way as per Drg. No. SA 22430 (Advance.)
49. -do- 8 way as per Drg. No SA 22440 (Advance.)
50. Electric lever lock and circuit controller combined 200 mm stroke as per Drg. No. SA 22701 (Adv) latest.
51. Earth Leakage detector single channel/Multi channel suitable to work on 110 Voltage 50 Hz single phase AC as per RDSO Specification No. 256 - 1971 (Revised 1977) complete with electromagnetic counter.
52. Terminal Block (M6 Terminals) as per IRS Specification No. IRS: S-75/2006 with latest amendment and IRS Drg. No. SA 23741A (Alt.4).
53. Fuse Link cartridge cylindrical head (2A, 4A and so on) non-deteriorating type, non-indication type as per IRS Specification No. IRS: S-78/2006 with latest amendment.
54. Indication type of low voltage (0.4A, 0.6A and 1.6 Amp.) Non-deteriorating Fuse links for signalling circuit as per RDSO Specification No. IRS: S-80/92 with latest amendment.
55. Fuse Block as per IRS(S) Drg. No. SA 23748 (Alt. 4)
56. Block instrument single line Neal's Ball Token type 'A' as per RDSO Drg. No. SA 20701(Adv) latest.
57. Block instrument SGE type tokenless double line without 3 position polarized relay, rated voltage of instrument 12 V DC, hand micro telephone without dial for using the instrument in AC electrified traction area as per specification no. IRS: S-22/91.
58 Handle type Tokenless Block instrument suitable for RE areas as per specifications no. IRS: S-98/2001 with latest amendments.

59. Signal colour light transformer 110/12V AC as per IRS specification No. IRS: S-59/77 with latest amendments & RDSO drawing SA-23014/M with latest amendments.
60. High Voltage Signal Transformer as per IRS Specification No. IRS: S-92/9388 with latest amendments.
61. Transformer 230 V AC/110V AC as per IRS Specification No. IRS: S-72/88 with latest amendments.
62. Indication supply transformer 230 V AC/24 V AC with tapping at 12 V AC as per IRS Specification No. IRS: S-83-92 with latest amendments.
63. Current Transformer 'I' type for lamp proving as per IRS Specification No. IRS: S-62/92 with latest amendments.
64. Lock key 'E' type as per IRS Drg. No. SA 3376/M latest amendments.
65. Interlocking Frame Ground Type Single Lever as per IRS Drg. No. SA 922/M (adv.) latest.
66. Point rodding (solid) 32 mm dia. 18' long as per No. IRS-S-5-62 with latest amendment & Drg. No. SA-3635A latest.
67. Roller Trestle 2 way as per RDSO Drg. No. S-3534/M (Adv) latest.
68. Roller Trestle 4 way as per RDSO Drg. No. S-3535/M (Adv) latest.
69. Roller stand as per RDSO Drg. No. S-3538/M (Adv.) latest.
70 Bottom Roller as per RDSO Drg. No. S-3539/M (Adv.) latest.
71. Top Roller as per RDSO Drg. No. S-3540/M (Adv.) ALT-1 latest.
72. Top Roller pin as per RDSO Drg. No. S-68/M (Adv.) latest.
73. Horizontal crank 300 mm x 300 mm as per RDSO Drg. No. SA 3414/M (Adv.)
74. --do-- 300 mm x 400 mm as per RDSO Drg. No. SA 3415/M (Adv.)
75. Vertical crank as per RDSO Drg. No. SA 3412/M (Adv.)
76. Adjustable crank as per RDSO Drg. No. SA 3416/M (Adv.)
77. Adjustable straight crank as per RDSO Drg. No. SA 3417/M (Adv.)
78. Compensator 253 mm x 406 mm as per RDSO Drg. No. SA 3504/M (Adv.) latest.
79. Accommodating crank 'Low' 103 mm center as per RDSO Drg. No. SA 5852/M (Adv.)
80. Deleted
81. Accommodating Crank 'Medium' 103 mm Center as per RDSO Drg. No. SA 5853/M (Adv.)
82. Accommodating Crank 'High' 103 mm Center as per RDSO Drg. No. SA 5854/M (Adv.)
83. Accommodating Crank 'Low' 125 mm Center as per RDSO Drg. No. SA 5856/M (Adv.)
84. Accommodating Crank 'Medium' 125 mm center as per RDSO Drg. No. SA 5857/M (Adv.)
85. Accommodating Crank 'High' 125 mm center as per RDSO Drg. No. SA 5858/M (Adv.)
86. Foundation Type 'A' as per IRS Drg. No. S-3529/M latest.
87. Foundation Type 'B'/Plate as per IRS Drg. No. S-3536 latest.
88. Foundation Type 'B' as per IRS Drg. No. S-3533 latest.

89. Shoe 1 or 2 way as per RDSO Drg. No. S-5814/M (Adv.) latest.

90. Shoe Joint (Butt end) and as per RDSO Drg. No. S-5817/M (Adv.) latest.
91. Flange connecting rod (Butt end) as per RDSO Drg. No. S-3600/M (Adv.) latest.
92. Angle Slide 1 or 2 way as per RDSO Drg. No. S-5818/M (Adv.) latest.
93. Switch Extension piece (BG) LH as per RDSO Drg. No. S-6063/M (Adv) ALT-3 latest.
94. Switch Extension piece (BG) RH as per RDSO Drg. No. S-6062A (Adv.) latest.
95. Lug Eye (Butt end) as per RDSO Drg. No. S-3631/M (Adv) latest.
96. Flush joint 32 mm (Butt end) as per RDSO Drg. No. SA 6051/M (Adv.) latest.
97. Solid Joint 32 mm (Butt end) as per RDSO Drg. NO. SA 6050/M (Adv.) latest
98. Joint solid 20 mm as per IRS Drg. No. SA 2160/M.
99. Joint Screw 20 mm as per IRS Drg. No. SA 2162/M.
100. Radial Guide standard tension Bracket as per RDSO Drg. No. S-3831 (Adv.)
101. Radial Guide Extension Bracket as per RDSO Drg. No. S-3832 (Adv.) latest.
102. Radial guide Lock Driving rod 33 mm as per RDSO Drg. No. SA 3833 (Adv.) latest.
103. Radial Guide connection rod 33 mm as per RDSO Drg. No. SA 3834 (Adv.) latest.
104. 3 Section Lock Bar inclined as per RDSO Drg. No. SA 3275/M (Adv.) latest.
105. Lock Bar Driving attachment as per RDSO Drg. No. S-3243/M (Adv).
106. Clip Lock Bar inside 60 kg. (UIC Rail clamp Type as per RDSO Drg. No. SA 8675 (Adv.)
107. Clip Lock Bar inside 52 kg. Rail Clamp Type as per RDSO Drg. No. SA 3560 (Adv.) latest.
108. Lock bar stop inside 60 kg. (UIC Rail clamp Type as per RDSO Drg. No. SA 8678 (Adv.)
109. Lock Bar Stop 52 kg. Rail clamp type as per RDSO Drg. No. SA 3591 (Adv).
110. Clip Lock Bar inside 90 R Rail Clamp Type (vertical) as per RDSO Drg. No. SA 3569 (Adv.) latest.
111. Lock Bar Stop 90 R Rail clamp Type as per RDSO Drg. No. SA 3592 (Adv.)
112. Roller path 52 kg. Rail as per RDSO Drg. No. SA 3578 (Adv.).
113. Roller path 90 R Rail as per RDSO Drg. No. SA 3579 (Adv.)
114. Lock facing point as per IRS Drg. No. SA - 5984. latest.
115. Lock facing point split stretcher bar (BG) as per IRS Drg. No. SA 5988 latest.
116. Lock facing point (HP Type) with key locks base as per IRS Drg. No. S - 3152/M latest.
117. Lock facing point (HP Type.) split stretcher bar (BG) 52 kg. Rail as per IRS Drg. No. SA 3162 B/M latest.
118. Lock facing point (HP Type) Split stretcher bar 90 R Rail as per IRS Drg. No. SA 3163/M latest.
119. Screw Joint adjusting (Butt end) as per RDSO Drg. No. S-3628/M (Adv.) latest.
120. Indicator point on Trestle with short lamp base as per RDSO Drg. NO. S-5777/2/M (Adv.).
121. Point Rodding connections for Siemens Electric Point machine as per RDSO Drg. No. SA 8800-01(Adv.) latest.

122. Point connection for GRS 5E point machine complete as per RDSO Drg. No. SA 9001-02 latest.
123. Electric Point & lock Detector with cross protection contacts as per RDSO Drg. No. SA 23331 (Adv.) latest with Detector slide slug to RDSO Drg. No. S-23385 (Adv) latest.
124. Point Rodding connection for Ericson Electric Point machine as per RDSO Drg. No. RDSO/S/3191-92 alt. 5 latest.
125. Lens Optical, Inside step without Hot Strip for long range colour light signal, 213 mm dia. 102 mm focal length 'clear' as per IRS specn. No. IRS-S-7/92 & IRS-S-10/78 latest and RDSO Drg. No. RDSO-S-23069 (Adv.) latest.
126. Lens Optical inside step Hot strip for long-range colour light signal, 213 mm dia. 102 mm focal length clear as per specn. No. IRS-S-7/92 & IRS-S-10/78 with latest amendments & RDSO Drg. No. RDSO-S-23061/M (Adv.) latest.
127. Lenses clear inside stepped spread light 213 mm dia x 102 mm focal length as per IRS Specn. No. IRS: S-7/92 & IRS-S-10/78 with latest amendments and RDSO Drg. No. S-23062/M (Adv.) latest.
128. Lens optical outside stepped for long range colour light signal, 140 mm dia. 13 mm focal length "RED" as per specn. No. IRS: S-7 /92 & IRS-S-10/78 with latest amendments and RDSO Drg. No. S-23063/M (Adv.) latest.
129. Lens Optical outside stepped for long range colour light signal, 140 mm dia 13 mm focal length 'Yellow' as per IRS-S-10/78 10 with latest amendments and RDSO Drg. No. S-23064/M (Adv.) latest.
130. Lens Optical outside step for long range colour light signal 140 mm dia 13 mm focal length 'Green' as per specn. No. IRS: S-7/92 & IRS-S-10/78 10 with latest amendments and RDSO Drg. No. S-23065/M (Adv.) latest.
131. Lens optical outside step 92 mm dia. 16 mm focal length 'Lunar white' as per specn. No. IRS: S-7 /92 & IRS-S-10/78 with latest amendments and RDSO Drg. No. S-23422 (Adv.) latest.
132. Lens optical inside step with molded prism for close up indication 127 mm dia and 70 mm focal length 'Clear' as per specn. No. IRS: S-7 /92 & IRS-S-10/78 with latest amendments and RDSO Drg. No. S-23421 (Adv.) latest.
133. Lens optical inside stepped 'Clear' 101 mm dia as per specification No. IRS: S-7 /92 & IRS-S-10/78 with latest amendments and RDSO Drg. No. S-2743/M latest.
134. Lamp Electric for Rly. Signalling 'Clear' 12 Volts. 33 watts. 3 pin double filament, double pole SL21 of Specn. No. IRS: S-57/2005(Rev.4) with the latest amendments.
135. Lamp Electric for Rly. Signalling 'Clear' 12 Volts. 25 watts, 3 pin double filament double pole SL17 of specn. No. IRS: IRS: S-57/2005(Rev.4) with the latest amendments.
136. Lamp Electric for Rly. Signalling 'Clear' 110 volts 25 watts 3 pin single filament SL33 of Specn. No. IRS: IRS: S-57/2005(Rev.4) with the latest amendments.
137. Lamp Electric Triple pole for Railway Signalling clear 12 V, 33 watt 3 Pin Double filament SL35 or SL35-A or SL35-B of Specification No IRS: S-57/2005(Rev.4) with the latest amendments.
138. Lamp Electric for Rly. Signalling 'Clear' 12 V, 4 watt. Single filament SL 5 of specn. No. IRS: S-57/2005 (Rev.4) & IS 1901 with latest amendments.

139. Deleted.
140. Lamp Electric 110 V, 25 watt as per IS specn. No. IS-418.
141. Lamp Electric 12 V, 1.2 watt as per IS Specn. No. IS-1901.
142. Lamp Electric 12V, 2.4 watt as per IS Specn. No. IS-1901.
143. Choke Type 'B' having annealed enamelled copper wire, as per IRS Specn. No. IRS: S-65/83 with latest amendments.
144. "Disc" Type Track Feed Resistance as per Drg. No. SA-20161/M (Adv.) to SA - 20166/M (Adv.).
145. Surge Discharger Type 'A' Non Restorating type as per IRS: S-52/76 with latest amendments but without hard ware materials i.e. Bolts, Nuts, washer etc. and with connection cables and Aluminum terminal lugs.
146. Track feed battery charger to work on 110V AC for charging 1 or 2 or 3 or 4 lead acid cell of 40/80 AH used in track circuits as per IRS specification No. IRS-S-89-2013, Ver 1.0 with latest amendments.
147. Deleted.
148. Battery chargers as per IRS Specn. No. IRS-S-86/2000 with latest amendments.
149. Voltage Stabilizer Ferro Resonant Type as per specn. No. IRS: S-74/89 with latest amendments.
150. Inverter (Ferro resonant version) for Railway Signalling Installations for 'On Line' applications as per IRS Specification No. IRS: S-82/92 with latest amendments.
.151. DG sets 7.5 KVA single phase with wall mounting type controlled panel, subsidiary control panel for remote operation and battery charging dynamos arrangement as per IRS- specification No. IRS-S-69/86 with latest amendments. The BHP rating of engine should not be less than 15 BHP. The DG sets are to be supplied incorporating the diesel engine having requisite type test approved from DRDE / DIGHI / PUNE or from National test houses.
152. Deleted.
153. Relay Group 3 Aspect Main signal plug in type with 100 terminal base plate (Complete with terminal connections and fixing screws) consisting of 13 Nos. of DC neutral miniaturized Relays conforming to IRS: S-46 and complete with suitable visual indication of similar to Siemens relay group NO. RS-SK-3525/46.
154 Relay Group 2 Aspect Main Signal plug - in type with 100 terminal base plate (complete with terminal connections and fixing screws) and Consisting of 10 numbers of DC neutral miniaturized relays conforming to IRS Specification IRS: S-46 and complete with a Suitable visual indications or similar to Siemens relay group No. RS-SK-3525/2.
155. Relay group shunt signal plug in type with 100 terminal base plate (complete with terminal connections and fixing screws) and consisting of 13 Nos. of DG neutral Miniaturized relays conforming to IRS Specification IRS: S-46 and complete with suitable visual indications or similar to Siemens relay Group No. RE/SE/3525/67.
156. Relay Route group plug in type with 100 terminal base plate complete with terminal connection and fixing screws and consisting of 5 Nos. of DC neutral miniaturized relays. Nos. of miniaturized interlocked relay conforming to IRS:

S-46 and complete with suitable visual indication or similar to Siemens Relay Group No. RS-SK-31/0002.

157. Point group for panel, Siemens make ACI 24V relay.
158. Relay, Fail safe Electronics Time Delay mounted on 'Q' series relay base & covered with fixed timing of 120 seconds, confirming to IRS: S-61/81, IRS: S-34 & IRS: S-23. The interlocking code for this unit shall be AFGKY.
159. Flasher Relay Siemens make as per drawing no. RS SK 30/0098 for 110 V AC operations.
160. Insulated Rod Joint 32 mm butt end as per RDSO'S Drg. No. SA.3637/M (Adv.) latest.
161. Insulation for Gauge tie plate (BG) complete with Insulating bush and washer each set comprising of
    (a) Insulating Plate for insulated Tie plate BG as per RDSO Drg. No. T-10372, 1 No.
    (b) Insulating bushing for insulated stretcher bar BG as per RDSO Drg. No. T-10368, 3 Nos.
    (c) Insulating washer for insulated stretcher, bar BG as per RDSO Drg. No. T-10371, 6 Nos.
162. Insulation for altering stretcher - bars (BG), each set comprising of.
    (a) Insulating plate for altering insulated stretcher bars BG as per RDSO Drg. No. T-10384, 2Nos.
    (b) Insulating bushing for altering insulated stretcher bars for BG as per RDSO Drg. No. T-10535, 4 Nos.
163. Insulation for stretcher bars BG. Each set Comprising of:
    (a) Insulating side plate for insulated stretcher bars BG as per RDSO Drg. No. T-10367, 1 No.
    (b) Insulating bushing for insulated stretcher bars BG as per RDSO Drg. NO. T - 10368, 2 Nos.
    (c) Insulating washer for insulated Stretcher bars BG as per RDSO Drg. No. T - 10371, 4 Nos.
164. Insulated Rail Joint Nylon (Four channel Type) 60 kg. UIC complete as per RDSO Drg. No. SA 22181(Adv) latest.
165. Insulated Rail Joint Nylon (Four channel Type) 52 kg. Complete as per RDSO Drg. No. SA 22101 (Adv.) latest without iron & steel parts.
166. Insulated Rail Joint Nylon (Four Channel Type) 90 R complete as per RDSO Drg. No. SA-22111 (Adv.) latest without Iron and Steel parts.
167. Insulated Rail Joint Nylon (Four Channel Type) 75 R complete as per RDSO Drg. No. SA - 22121 (Adv.) latest without iron & steel parts.
168. Insulated Rail Joint Nylon (Four Channel Type) 60 R complete as per RDSO Drg. No. SA-22131 (Adv.) latest without iron & steel part.
169. Insulated Rail joint fishplate for 52 kg as per RDSO Drg. No. S-22102 (Adv.) ALT-2 and for 90 R as per RDSO Drg. No. S-22112 (Adv.) ALT- 2.
170. Rail Joint Insulated backing plate (52 kg.) as per RDSO Drg. No. S-2107 (Adv.) latest.
171. Rail joint Insulated Backing plate '90 R' as per RDSO Drg. No. S-22117 (Adv.) latest.
172. Rail joint Insulated ferrule as per RDSO Drg. No.22108 (adv.) latest.

173. Channel Pin single Groove 7 mm dia. (for 4 mm dia. Bond wire) as per Drg. No. S-69/M.
174. Bond wire clip (52 kg. - 90R Rails) as per RDSO Drg. No. S-22167 (Adv.) latest.
175. Wire GI soft. 4 mm (8 SWG) as per IS specn. No.IS-280.
176. Magneto Telephone Desk Type to IRS TC 36 - 85 with latest amendments.
177. Multiway Isolating terminal Blocks (Barrier type) as per IRS Specification No. IRS: S-70/82 with latest amendments.
178. Wire Insulator as per IRS Specification No. IRS: S-47/74 with latest amendments.
179. Light Unit CLS Lamp holder Unit (for Triple pole Lamp as per Drg. No. SA 2483 (Adv.) ALT.-1 Latest.
180. PVC insulated armoured signalling cable 2 core 2.5 sq. mm as per specification No. IRS-S-63/2014, Rev. 4 with latest amendments.
181 Electric lever lock and circuit controller combine (DW) 40 mm stoke as per drg. No. SA 21201/M (adv.) latest.
182. Electric point operating machine type Bsg to operate on 110V DC, hauling internal locking non-trailable design (Siemens Type). As per Siemens specification and Drg. A.C immunity level & throwing force as per IRS-S-24-90 with latest amendments.
182 Key lock relay with different ward combinations (one extra set of ward plate for point machine to supplied with each relay) as per specification No. IRS-S-46
183. Relay, Non-AC Immune, plug -in type, Style 'QN1', Neutral line, 24VDC 8F.8B contacts, front & back contacts metal to carbon with plug board, retaining clip & connectors conforming to BRS: 930, IRS: S 34 & IRS: S 23. The interlocking code for this unit shall be ABCDF.
184. Relay, Non-AC Immune, plug -in type, Style 'QN1', Neutral line, 24VDC 12F.4B contacts, front & back contacts metal to carbon with plug board, retaining clip & connectors conforming to BRS: 930, IRS: S 34 & IRS:S 23. The interlocking code for this unit shall be ABCDE.
185. Relay, AC Immune, plug -in type, Style 'QNA1', Neutral line, 24V DC, 8F.8B contacts, front & back contacts metal to carbon with plug board, retaining clip & connectors conforming to BRS: 931A, IRS: S 60, IRS: S 34 & IRS: S 23. The interlocking code for this unit shall be ABDGH.
186. Relay AC Immune, plug -in type, Style 'QNA1', Neutral line, 24V DC, 12F.4B contacts, front & back contacts metal to carbon with plug board, retaining clip & connectors conforming to BRS: 931A, IRS: S 60, IRS: S 34 & IRS: S 23. The interlocking code for this unit shall be ABDFH.
187. Electric lamp filament switching unit for colour light signals, to specification No. RDSO/SPN/158/2000.
188. Relay, AC Immunized, DC shelf type, Neutral line tractive armature 1000 ohms, 6F/B contacts (non proving type), front contacts metal to carbon and back contacts metal to metal as per specification No. BS-1659 class 'A', IRS: S 34 & IRS: S 23. (as applicable) along with AC immunity requirement as per Annexure "I".
189. Relay, AC Immunized, DC shelf type, Neutral line tractive armature 1000 ohms, 4F/B contacts (non proved type front contacts metal to carbon and

back contacts metal to metal as per specification No. BS-1659 class 'A', IRS: S 34 & IRS:S 23. (as applicable) along with AC immunity requirement as per Annexure "I".

190. Relay, AC Immunized, D.C shelf type, Neutral track tractive armature 9 ohms, 4F/B contacts (non proved type). Front contacts metal to carbon and back contacts metal to metal confirming to specification No. BS-1659 -1950 (upto amendment No.3) RE specification No. RE/S&T/187/11 dt. 14.8.68 IRS: S 34 & IRS: S 23. (as applicable).
191. Relay, plug-in type, Style 'ON' aspect. A.C lamp proving relay unit, slow release neutral line relay, metal to metal, 3F.3B contacts mounted in a mini relay group housing or individual relay, complete with plug-board and connectors shall be suitable for working in series with the primary winding of colour light signal transformer conforming to IRS: S59 (110V AC / 12V AC) feeding 25/33 watt signal lamps conforming to IRS: S46, IRS: S34 & IRS: S23. The special interlocking code for this unit shall be CFKMY.
192. Relay, plug-in type, Style 'OFF' aspect. A.C lamp proving relay unit, slow release neutral line relay, metal to metal, 3F.3B contacts mounted in a mini relay group housing or individual relay, complete with plug-board and connectors shall be suitable for working in series with the primary winding of colour light signal transformer conforming to IRS: S59 (110V AC / 12V AC) feeding 25/33 watt signal lamps conforming to IRS: S46, IRS: S34 & IRS: S23. The special interlocking code for this unit shall be CFJKN.
193. Relay, plug-in type, Style 'ROUTE' aspect. A.C lamp proving relay unit, slow release neutral line relay, metal to metal, 3F.3B contacts mounted in a mini relay group housing or individual relay, complete with plug-board and connectors shall be suitable for working in series with the lighting circuit of the junction type route indicator (5 lamps, 110V / 25 Watt, double pole, connected in parallel). Conforming to IRS: S46, IRS: S34 & IRS: S23. The special interlocking code for this unit shall be CFKLY.
194. Relay, DC polarized, 3 position, 77 ohms, 1N/1R contact metal to metal, center biased armature confirming to IRS-S-31-80, IRS:S-34 & IRS:S-23 (as applicable).
195. Tag Block 200 way conforming to specification No. IRS-S-77/2006 with latest amendment with Drg. No. SA-24751.
196. Tag Block 160 way conforming to specification No. IRS-S-77/2006 with latest amendment with Drg. No. SA-24752.
197. Low maintenance lead acid stationary secondary cell as per IRS specification No. IRS-S-88/2004, Nominal voltage 2V, each of 80/40 AH with transparent container for use of Railway signalling and telecommunication applications.
198. Dual bank battery charger 12V to 36V DC 1 Amp capacity complete with two banks of 9 Nos. each of twin cells of 4V 12 AH capacity of 100 hrs. rate low maintenance lead acid batteries as per IRS- specification No. IRS-S-85/92 with latest amendments.
199. Transformer 230V AC / 110V AC 1KVA as per IRS- specification No. IRS-S-72/88 with latest amendments.
200. Point group for panel, Siemens make ACI 24V relay. Point group for panel, Siemens make ACI 24V relay.

201. Transmitter & Receiver for handle type tokenless Daido block instrument suitable for RE area as per specification no. IRS: S-98/2001 with latest amendments.
202. SMPS based integrated power supply system (IPS) as per RDSO specifications No. RDSO/SPN/165/2004 with latest amendments.
203. Specifications for LED signal lighting unit as per RDSO specifications No. RDSO/SPN/153/2002 with latest amendments.
204. Specifications for Data logger as per RDSO specifications No. IRS: S-99/2006 with latest amendments.

Note: i) The above list is not exhaustive. All other items not covered under the drgs./specification shall be referred to as per relevant RDSO/IRS/IS and Railway practice in force.

ii) All references to drgs./ specification or elsewhere in the tender document shall be taken to the latest amendment.