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Addendum and Corrigendum No. 02B

Name of Work: - Bid No. DM/ST/COR-OF/100, Package 24: Design, Supply, Installation, Testing and Commissioning of Signalling &Train Control, Platform Screen Doors and Telecommunication Systems for Delhi – Ghaziabad – Meerut RRTS Corridor of NCRTC

S.N.	Bid Document Section / Clause No.	Existing Document/Form/Clause/ Sub Clause	Modified Document/Form/Clause/Sub Clause
1	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control	DM/ST/COR-OF/100, Package 24: Design, Supply, Installation, Testing and Commissioning of Signalling &Train Control, and Telecommunication Systems for Delhi – Ghaziabad – Meerut RRTS Corridor of NCRTC	DM/ST/COR-OF/100, Package 24: Design, Supply, Installation, Testing and Commissioning of Signalling &Train Control, **Platform Screen Doors** and Telecommunication Systems for Delhi – Ghaziabad – Meerut RRTS Corridor of NCRTC
2	Employer's Requirement Part-2, Section 6G: PS- Platform Screen Doors		**New Section 6G has been added in Employer's Requirement Part-2 as Attachment No. 1 in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.**
3	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, List of Standards/Specifications, New Note		**[Add the following New Note in PS]** **Note: If any standard is superseded by the new revision/version then Latest issues or versions of internationally recognised standards need to be considered.**
4	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-2, Clause No. 2.3.2	As a contingent measure there could be a temporary IBL constructed on some elevated Station, which shall be	As a contingent measure there could be a temporary IBL constructed on ~~some~~ **one of the** elevated Station, which shall be removed **and the equipment installed at**

		removed once final depot is commissioned. Signalling plan and associated works shall be modified accordingly.	**temporary IBL can be re-used,** once final depot is commissioned. Signalling plan and associated works shall be modified accordingly.
5	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-3 New Clause No. 3.2.1.3		**[Add the following New Sub Clause No. 3.2.1.3 in Clause No. 3.2.1 in PS]** **Procurement of following items shall be done only from local suppliers:** **1) Depot Point Machine with other accessories: High thrust, trailable Point machine** **2) 3 aspect, Shunt, Buffer light and route indicator signals with accessories** **3) Power Distribution Cubicle with accessories for Interlocking stations, Secondary stations (station with object controller) Secondary stations (Non-Interlocking Station)** **4) Control terminal with VDU display and associated accessories: Interlocking VDU** **5) Junction boxes for Signals and Point Machines** **6) Earthing material per station/depot** **7) Maintenance workstation at OCC, station** **8) All type of UPS** **9) VRLA maintenance free batteries** **10) Spare cell charger**

			11) Indoor & Outdoor DATA and power Signalling Cables
6	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-3 Clause No. 3.2.2.1 Point no. 3	Assist and furnish all information, documents required by Independent Safety Assessor (ISA), if appointed by NCRTC;	Assist and furnish all information, documents required by Independent Safety Assessor (ISA), ~~if~~ appointed by NCRTC;
7	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-3 Clause No. 3.6.3.1	The Signalling and Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm respectively at two (02) suitable places for constructing temporary storage facilities for Contractor. The …….. till end of Defect Liability Period.	The Signalling and Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm respectively **at each of the two (02) suitable places** for constructing temporary storage facilities for Contractor **as mentioned in Appendix A**. The ……..end of Defect Liability Period.
8	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 Clause No. 4.6.3.1.	The …….. all train types including, 1) EMU consists 2) Empty rakes 3) Engineer's trains, Tower Wagons, Light locomotives, RGM,CMV etc. 4) Accident Relief Train/ RRV	The …… all train types including, (1) EMU consists ~~(2) Empty rakes~~ (3) **Engineer's** ~~train~~ **Vehicle**, RGM and CMV ~~(4) Accident Relief Train/ RRV~~
9	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 Clause No. 4.6.3.1.	All the above mentioned train types shall be equipped with ETCS onboard equipment.	All the above mentioned train types shall be equipped with ETCS onboard equipment. **For train configurations refer Appendix A of this PS.**
10	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 New Clause No. 4.6.3.3		**[Add the following New Sub Clause No. 4.6.3.3 in Clause No. 4.6.3 in PS]** **Maintenance Vehicles shall be equipped with a single unit of Redundant ETCS Onboard, underframe and roof**

			mounted S&T equipment. Maintenance vehicles shall be capable of moving in ATP/FS mode in both the directions with same features.
11	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 Clause No. 4.7.1	Notwithstanding the service capacity requirement above, the Train Control and Signalling System shall provide a minimum theoretical signalled headway of 120 seconds and an operational headway of 180 secs on D-G-M Corridor signalled routes between- (1) SKK ……stations. This headway shall be measured on the line using the respective EMU performance for 6-car trains with 30-second dwells at intermediate stations and a minimum 2-minute layover at the terminal stations. The headway calculation will include PSD operation time. It …… on regular basis.	Notwithstanding the service capacity requirement above, the Train Control and Signalling System shall provide a minimum theoretical signalled headway of 120 seconds and an operational headway of 180 secs **in ETCS Level 2 (with fixed virtual blocks)** on D-G-M Corridor signalled routes between- (1) SKK ……..stations. This headway shall be measured on the line using the respective EMU performance for 6 **and 9**-car trains with 30-second dwells at intermediate stations and a minimum 2-minute layover at the terminal stations. The headway calculation will include PSD operation time. **The contractor shall develop all software for both 6- car and 9-car RRTS trains. Infrastructure shall be installed to cater mixed fleet of 6-car and 9-car RRTS trains.** It …….. on regular basis.
12	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 Clause No. 4.8.5.	The time necessary to the initialization of a sub-system (trackside ATC, trainborne ATC, interlocking, track to train transmission, train detection) shall be as short as possible and no greater than 40 seconds.	The time necessary to the initialization of a sub-system (trackside ATC, ~~trainborne ATC,~~ interlocking, track to train transmission, train detection) shall be as short as possible and no greater than 40 seconds **and for trainborne ATC it shall not be greater than 90 sec.**
13	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 Clause No. 4.10.6.1	The normal mode of operation for trains equipped for ATP Mode shall be ATP/FS Mode in ETCS Level 2.	The normal mode of operation for trains ~~equipped for ATP Mode~~ shall be **ATO** and ATP/FS Mode in ETCS Level 2.

14	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-4 New Clause No. 4.12.8		**[Add the following new Sub Clause No. 4.12.8 in Clause No. 4.12 in PS]** **Contractor has to take interference avoidance measures where RRTS is crossing or going in parallel with Indian Railway (IR) alignment and take approval from Engineer/Employer.**
15	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.1.1	Operating Modes shall be according to the ETCS Level 2 and ETCS Level 1. In normal situations ETCS Level 2 shall be used for train operation and in case of failure of same, ETCS Level 1 shall be used. Transition from one Level to another shall be smooth and it shall comply SRS 3.6.0 Baseline 3 Release 2 or latest issued. The Train Control and Signalling System shall provide the following modes of train operation as a minimum. The remaining modes shall be finalized as per SRS 3.6.0 Baseline 3 Release 2 or latest issued during the design stage.	Operating Modes shall be according to the ETCS Level 2 and ETCS Level 1**_ on mainline and Jangpura stabling lines**. In …… or latest issued. **The Train Control and Signalling System shall provide the following modes of train operation as a minimum in ETCS level 2. In ETCS level 1 all the following modes shall be provided except ATO.** The ……during the design stage.
16	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.1.2.1	In ……. of ATP functions.	**ATO mode shall be available in ETCS Level 2.** In ……. of ATP functions.
17	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.1.2.2	ATO mode shall be the normal mode of operation	ATO mode shall be the normal mode of operation **in ETCS Level 2.**
18	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Clause No. 5.1.3	5.1.3.1 In ATP Mode …… signals. 5.1.3.2 ATP Mode ……..of ATO. 5.1.3.3 In ATP Mode, ……shall:	5.1.3.1. In ATP/**FS** Mode ……. signals. 5.1.3.2. ATP/**FS** Mode ……. of ATO.

		6) Prevent the train from starting if train doors are not detected closed.	5.1.3.3. In ATP/**FS** Mode, …… shall: (6) Prevent the train from starting if train doors **and PSD** are not detected closed.
19	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.1.3.5	ETCS Level 1, ATP Mode ……..Employer's Drawings. However, Depot test track shall be equipped with both ETCS Level 1 and Level 2.	ETCS Level 1, **ATP/FS** Mode ……. Employer's Drawings. However, Depot test track shall be equipped with both ETCS Level 1 and **ETCS** Level 2.
20	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.2.2.	In …… counter.	In ……..counter. **The transition between modes shall be as per SRS 3.6.0 Baseline 3 Release 2 or latest issued.**
21	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.2.2	If ……..at least 2 sec. before the intervention of the full service brake until the actual speed is reduced to the permitted speed, then the train operator must be capable of selecting release of full service braking. The warning ……..the emergency brake.	If …… at least 2 sec. before the intervention of the full-service brake ~~until the actual speed is reduced to the permitted speed, then the train operator must be capable of selecting release of full service braking~~. **If speed is not controlled within this time, full-service brake shall be applied and get released when the actual speed is reduced to the permitted speed.** The warning ……..the emergency brake.
22	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.2.3	Station stopping Monitoring and Supervision The ATC system should provide advisory indications on the Driver's MMI to help the train operator to stop correctly the train in station. If …… indications.	Station stopping Monitoring and Supervision The ATC system should provide advisory indications on the Driver's MMI **in ATP/FS mode** to help the train operator to stop correctly the train in station. If ……. indications.

23	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.5.5	Platform Screen Doors 1) The …….. platform screen doors etc. 2) The ……..depot test track. 3) Signalling contractor shall interface with the PSD contractor as per Appendix A of this PS if the PSD contractor is available. 4) In case the PSD ……. subsequently handed over the employer.	Platform Screen Doors (1) The …… platform screen doors etc. (2) The ……. depot test track. (3) ~~Signalling contractor shall interface with the PSD contractor as per Appendix A of this PS if the PSD contractor is available.~~**Interface among different sub system shall be done as per** Appendix A of this PS. (4) Deleted
24	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.6.1.	Point machine on the main line shall be electric, shall conform to IRS S-24 or any other international standard and shall be already proven type in railway environment. The …… Employer shall be final and binding.	Point machine on the main line shall be electric, shall conform to ~~IRS S-24 or any other~~ international standard and shall be already proven type in railway environment. The ……Employer shall be final and binding.
25	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.6.2.	Main line points shall be non-trailable. Depot points, where speed does not exceed 25 kmph, shall be preferably trailable. Main line point machine shall be used in conjunction with external mechanical lock. Main Line Point Machine ……. operating on 3φ-380V AC or 110V DC.	Main line points shall be non-trailable. ~~Depot points, where speed does not exceed 25 kmph, shall be preferably trailable.~~ Main line point machine ……. operating on 3φ-380V AC or 110V DC.
26	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.7.2.	Train detection ……equipment or not. Around station area train detection shall be achieved through Axle counters. A minimum two block sections shall be defined through axle counters between two consecutive RRTS stations. A minmum of one block section shall be defined through axle counters between two consecutive MRTS stations and between two different type of stations , however final layout will be finalized during design phase.	Train detection …….. equipment or not. Around station area train detection shall be achieved through Axle counters. A minimum of two ~~block~~ **track** sections shall be defined through axle counters between two consecutive RRTS stations excluding point zones. A minimum of one-~~block~~ track section shall be defined through axle counters between two consecutive MRTS stations and between two different type of stations excluding point zones, however final layout shall be finalized during the design phase.

27	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 New Clause No. 5.3.7.3	Not used	**[Add the following new Sub Clause No. 5.3.7.3 in Clause No. 5.3.7 in PS]** **For Axle counter, Diagnostic and maintenance workstation shall be provided at all Interlocking station and at remote location by S&T contractor. Axle counter reset function shall be finalized during design stage.**
28	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.3.8.3	Separate Interlocking units shall be provided for each Depot. The Depot ……. should be provided to cover the entire Line. In any case, stations with points and crossings must have object controllers.	Separate Interlocking units shall be provided for each Depot. **The test track shall be controlled by the same Depot interlocking.** The Depot …….should be provided to cover the entire Line. In any case, stations with points and crossings must have object controllers.
29	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 New Clause No. 5.3.8.3		**[Add the following new Sub Clause No. 5.3.13 in Clause No. 5.3 in PS]** **Staff Protection Key** **Function of Staff Protection Key shall be provided to authorize movement of Rolling Stocks from protected area to unprotected area.**
30	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.8.3.2.	All cars shall be provided with redundant independent ATO and ATP equipment. The redundancy requirement …… operator.	All ~~cars~~ **MRTS/RRTS trains** shall be provided with redundant ~~independent~~ ATO and ATP equipment. The redundancy requirement …… operator.
31	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.9.1	All Train Control and Signalling ……..failure. This facility shall be available on CBI, Trackside ATC, Onboard ATC, Local TMS, CTMS, Radio communication network including access points etc.	All Train Control and Signalling ……failure. This facility shall be available on CBI, Trackside ATC, Onboard ATC, Local TMS, CTMS, Radio communication network including ~~access points~~ **Network Train Radio** etc.

32	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.11.1.1.	Line side signals …… as follows: • At stations ……working.	Line side signals …….as follows: • At stations …….working. • **At all other locations to meet the requirement of ETCS Level 1.**
33	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 New Clause No. 5.11.1.4.	Not Used	**[Add the following new Sub Clause No. 5.11.1.4 in Clause No. 5.11.1 in PS]** **All Signal Posts shall be placed on the left side of the Track of the approaching Train to which they refer. In case of any Deviation approval of Competent Authorities shall be taken.**
34	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 New Clause No. 5.11.2.6		**Add the following new Sub Clause No. 5.11.2.6 in Clause No. 5.11.2 in PS]** **Route Indicators are not required.**
35	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No.5.19.8.2 Point No.7	7. Temporary speed restrictions shall be capable of being imposed over any track segment based on selection of kilometric points on complete line.	7. Temporary speed restrictions shall be capable of being imposed over any track segment **of maximum length 250 m** based on selection of kilometric points on complete line.
36	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.39.2.1	The Rolling …… this log. In addition, the train borne log shall be transmitted in real time to OCC/SCC/DCC through RBC.	The Rolling Stock …… this log. ~~In addition, the train borne log shall be transmitted in real time to OCC/SCC/DCC through RBC.~~ **Data download facility shall be provided as per Appendix A.**
37	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.42.3 Point No. (a)	Separate OFC cable for Signalling- Min 24 Fibres, to be used for but not limited to: - 1) TMS backbone 2) IXL-IXL connectivity 3) IXL-Object Controller connectivity 4) IXL-RBC Connectivity	Separate OFC cable for Signalling- Min 24 Fibres, to be used for but not limited to: - 1) TMS backbone 2) IXL-IXL connectivity 3) IXL-Object Controller connectivity 4) IXL-RBC Connectivity

		5) AXL Counter to Axle Counter connectivity etc.	5) ~~AXL~~ **Axle** Counter to Axle Counter connectivity ~~etc.~~ **6) OCC to BCC connectivity etc.**
38	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.43	Asset Protection Systems Asset Protection System (APS) shall include Hot Axle Box Detector (HABD). The…… S&T Contractor.	Asset Protection Systems Asset Protection System (APS) shall include Hot Axle Box Detector (HABD). **The system shall be minimum SIL2, however hazard analysis shall be carried out during detailed design stage to identify appropriate SIL level for the complete functionality.** The ……..S&T Contractor.
39	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.43.7	An An alarm from HABD shall result in a revoking/shortening of MA, manually if required.	~~An~~ An alarm from HABD shall result in a revoking/shortening of MA, manually **through the TMS**, if required.
40	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 5.43.9	A diagnostic workstation shall be provided to display the detected values.	~~A diagnostic~~ Workstations shall be provided ~~to display the detected values.~~ by signaling contractor **as defined in Appendix A**.
41	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-6 New Clause No. 6.3.2.3		**[Add the following New Sub Clause No. 6.3.2.3 in Clause No. 6.3.2 in PS]** **Key Management System shall be implemented as per SRS 3.6.0 Baseline 3 Release 2 or latest issued.**

42	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-6 Clause No. 6.4.3.4	Development process of TMS and ATO systems shall be designed, manufactured and validated to Safety Integrity Level 2 as defined in the CENELEC standard EN50126, EN50128 and EN50129. All potentially unsafe effects of safety-related functions performed by TMS and ATO shall be mitigated by mandatory interaction with SIL4 subsystems (ATP and CBI).	**Software** Development process of TMS and ATO systems ~~shall be designed, manufactured and validated to~~ **shall follow** Safety Integrity Level 2 as defined in the CENELEC standard EN50126, EN50128 and EN50129. All potentially unsafe effects of safety-related functions performed by TMS and ATO shall be mitigated by mandatory interaction with SIL4 subsystems (ATP and CBI). **Contractor shall provide SIL level of each proposed subsystem in Section 4A, Annexure to Technical Proposal along with other information.**
43	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-5 Clause No. 6.5 Point No. 2	Hazard Analysis conducted for the various phases of the system life cycle as defined in GS.	Hazard **Identification and Risk Analysis** conducted for the various phases of the system life cycle as defined in GS.
44	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-8 Clause No. 8.1.6	The Employer' Engineer may conduct independent safety audit and shall therefore require access to all the relevant design and product information. The ….. safety cases etc.	The Employer' Engineer **shall** conduct independent safety audit and shall therefore require access to all the relevant design and product information. The …… cases etc.
45	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-8 Clause No. 8.1.18	The contractor shall make available technically qualified persons for different systems (ETCS Level 1, ETCS Level 2, LTE, ATO, Interlocking, TMS etc.) at site (Delhi-Ghaziabad-Meerut) to carry out the activities listed in this chapter.	The contractor shall make available technically qualified persons for different systems (ETCS Level 1, ETCS Level 2, LTE, ATO, Interlocking, TMS etc.) at site (Delhi-Ghaziabad-Meerut) to carry out the activities ~~listed in this chapter.~~ **to meet the Employer's Requirement. The Requirement of Key Personal is defined in Section 4A Bidding Forms, Annexure for Technical Proposal.**
46	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-8 Clause No. 8.7.2.5, Point No. 5	Radio network test containing as a minimum: •Train to Radio access point, RSSI (Received signal strength indicator) and Link Quality verification at these locations, but not limited to:	Radio network test containing as a minimum: •Train to **wayside LTE** ~~Radio access point~~, RSSI (Received signal strength indicator) and Link Quality verification at these locations, but not limited to:

47	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-8 Clause No. 8.15.1	The …… Test Lab of ETCS.	The …...Test Lab of ETCS. **This Notified body and ISA appointed by Employer shall not be same.**
48	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-10 Clause No. 10.1.4 Point No. 6	Appropriate fixed means of access shall be provided for easy and safe maintenance of Trackside equipment such as signals, route indicators.	Appropriate fixed means of access shall be provided for easy and safe maintenance of Trackside equipment such as signals~~, route indicators~~.
49	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 New Clause No. 11.1.4		**[Add the following new Sub Clause No. 11.1.4 in Clause No. 11.1 in PS]** **Employer may engage O&M agency for managing revenue operations, in that case DLP shall be handled by O&M agency on behalf of the Employer.**
50	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 Clause No. 11.2.1.3	Staff of employer/O&M agency shall be deputed at suitable locations for first line of maintenance. Contractor shall depute its team of sufficient strength and competent engineers in each shift to support Employers' team in first line of maintenance. Location of contractor's staff shall be decided by Employer. It may change as the opening of section progresses.	Staff of employer/O&M agency shall be deputed at suitable locations for first line of maintenance. Contractor shall depute its team of sufficient strength and competent engineers in each shift to support Employer's team/**O&M agency's team** in first line of maintenance. Location of contractor's staff shall be decided by Employer/**O&M agency**. It may change as the opening of section progresses.
51	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 Clause No. 11.2.2.2	Should the Employer, during the DLP require further investigations at other sites throughout the railway, the Employer will formally request the Contractor to undertake such investigations, and the Contractor shall undertake the same.	Should the Employer, during the DLP require further investigations at other sites throughout ~~the railway~~ **the D-G-M RRTS corridor**, the Employer will formally request the Contractor to undertake such investigations, and the Contractor shall undertake the same.
52	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 Clause No. 11.5.5.1	The Tenderer shall also deliver manuals in electronic format. This is in addition to the submission of manuals in hardcopies. The ……..Employer's Engineer.	The Tenderer shall also deliver the **same** manuals in electronic format. The……. Employer's Engineer.

53	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 Clause No. 11.7	Predictive maintenance tool: Predictive maintenance tool shall be provided at all Interlocking stations and at remote locations, to detect anomalous behavior of field gears before the complete failure of field devices. 11.7.1 A ……be established. 11.7.2 The ……. locations. 11.7.3 The …… as follows: - 11.7.4 Green-OK……. schedule. 11.7.5 Yellow……. performed. 11.7.6 Red- Immediate Corrective Maintenance is required.	Predictive maintenance tool **a)** Predictive maintenance tool shall be provided at all Interlocking stations and at remote locations, to detect anomalous behavior of field gears before the complete failure of field devices. 11.7.1 A …….. be established. 11.7.2 The …… locations. 11.7.3 The …….. as follows: - 11.7.4 Green-OK, ……. schedule. 11.7.5 Yellow- ……. performed. 11.7.6 Red- Immediate Corrective Maintenance is required. **b) To predict the health of balises, balise checker shall be provided in two RRTS trains and two maintenance vehicles.**
54	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-11 Clause No. 11.8.4	This shall ……...deployment of experts for SOM.	This shall …….. …….. deployment of experts for SOM. **The contractor shall provide the supervisory maintenance staff mentioned in this clause, in addition to sufficient trained and competent personal required during DLP period as per clause 11.2 of this chapter.**
55	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-12 Clause No. 12.8.4.2	The simulator shall emulate the following system using real sub-system and simulators	The simulator shall emulate the following system using **physical hardware of each** ~~real~~ sub-system and simulators
56	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-12 Clause No. 12.8.4.2, Point no. 6	EPC including access points.	EPC including ~~access points~~ **Radio Access Network**

57	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-12 Clause No. 12.8.4.2, Point no. 15	Handheld and Fixed Radio users The …….Train detection, Trackside & Onboard ATP, TMS, Data communication system (including EPC, EUTRAN, UEs, Dispatchers etc.), Radio access point, antennas, network elements (switches, routers etc), power supply modules etc.	Handheld and Fixed Radio users The ……Train detection, Trackside & Onboard ATP, TMS, Data communication system (including EPC, **NMS**, EUTRAN, UEs, Dispatchers etc.), ~~Radio access point,~~ antennas, network elements (switches, routers etc), power supply modules etc.
58	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-12 Clause No. 12.8.4.6	E-learning/ CBT: The simulator shall be designed to enhance the knowledge of maintenance staff by e-learning/CBT, normal operation of the system, fault simulation and their troubleshooting, physical operation of field functions, 3D remedial action to simulate assembly and disassembly of different modules/sub-systems and circuit simulation to conduct "what-if" analysis.	E-learning/ CBT: The simulator shall be designed to enhance the knowledge of maintenance staff by e-learning/CBT **including** normal operation of the system, fault simulation and their troubleshooting, physical operation of field functions, 3D remedial action to simulate assembly and disassembly of different modules/sub-systems and circuit simulation to conduct "what-if" analysis.
59	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-13 Clause No. 13.4.1	Tenderer …….. systems/ subsystems. The contractor will not impose any technical or commercial condition on the Indian company receiving transfer of technology and this stipulation should be reflected in the MOU as well. In regard to TMS, the Indian Company shall, before the expiry of contract, become independent in handling of future changes in TMS configuration failing which a penalty of INR 1 crore shall be imposed on the contractor.	Tenderer ……systems/ subsystems. The contractor will not impose any technical or commercial condition on the Indian company receiving transfer of technology and this stipulation should be reflected in the MOU as well. ~~In regard to TMS, the Indian Company shall, before the expiry of contract, become independent in handling of future changes in TMS configuration failing which a penalty of INR 1 crore shall be imposed on the contractor.~~
60	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-14 Clause No. 14.1.3		**[Add the following new Sub Clause No. 14.1.3 in Clause No. 14.1 in PS]** **CDE user accounts and Training on CDE environment will be provided to the Contractor by the Employer.**

61	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter-15 Clause No. 15.6.4	Interoperability Requirement (1) The LTE system …….. the LTE OEM. The Inter-Operability Certificates have to be submitted for the EPC and RAN Infrastructure Equipment.	Interoperability Requirement (1) The LTE system ……the LTE OEM. **The Accredited test house of LTE/3GPP and ISA appointed by Employer shall not be same.** The Inter-Operability Certificates have to be submitted for the EPC and RAN Infrastructure Equipment.
62	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.1	Headway The design shall be based on a theoretical headway of 120 secs in order to permit trains to operate on a sustained headway of 180 secs under normal operations as described in the Technical Specification.	Headway The design shall be based on a theoretical headway of 120 secs in order to permit trains to operate on a sustained headway of 180 secs **in ETCS Level 2 (with fixed virtual blocks)** under normal operations as described in the Technical Specification.
63	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.2.1	NORMAL OPERATION Allowed running …… turnouts and crossovers. The permissible speed over 1:9 turnouts for Standard Gauge will be 40 km/hr. and 1:7 turnouts for Standard Gauge will be 25 km/hr. Speed ……. of all normal and temporary speed restrictions.	NORMAL OPERATION Allowed running …… turnouts and crossovers. The permissible speed over 1:9 turnouts for Standard Gauge will be 40 km/hr. **(may increase)** and 1:7 turnouts for Standard Gauge will be 25 km/hr. **(may increase)**. Speed ……. of all normal and temporary speed restrictions.
64	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.2.4	DEGRADED MODE When a train is operating in Degraded mode, the speed shall be limited to 25/40 km/h. The on-board ATP equipment shall enforce this limit.	~~DEGRADED MODE~~ **RESTRICTED MANUAL MODE** When a train is operating in ~~Degraded mode~~ **Restricted manual mode**, the speed shall be limited to 25/40 km/h. The on-board ATP equipment shall enforce this limit.
65	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.3	Reverse Running	Reverse Running **(Bi-directional)**
66	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.4	Station Stopping If the Train stops within safety conditions for door opening i.e. door opening authorisation window, the Signalling &	Station Stopping If the Train stops within safety conditions for door opening i.e. door opening authorisation window, the Signalling &

		Train Control system will provide the door enable signal to the train operator to open the doors manually on the correct side of the platform. If …….signal from TMS.	Train Control system will provide the door enable signal to the train operator to open the doors manually on the correct side of the platform **in ATP/FS mode**. If ……signal from TMS.
67	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 3.7.1	The size and …….track geometry. The back-up signalling (in ETCS Level 1 and Degraded mode) shall use the specification for Rolling Stock is as given in Appendix A of this PS. The signal designer ……. actual vehicles supplied.	The size and location …….track geometry. The back-up signalling (in ETCS Level 1 and Degraded mode) shall use ~~the specification for~~ Rolling Stock **Performance Requirements** is as given in Appendix A of this PS. The signal designer ..... actual vehicles supplied.
68	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 8.9	There should be a provision to declare weather condition as wet from OCC on …….reduction in braking performance.	**Not Used**
69	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix-D Clause No. 13, New Note		**[Add the following new note to Clause No. 13 in PS]** **Note: Protocols / data structures shall be shared with NCRTC by the signaling contractor and it shall be property of NCRTC. NCRTC shall have the right to use and implement these protocols / data structure in future corridors for achieving interoperability between different signaling systems.**
70	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix J Clause No. 5.3	Material description Specifications: Composition: Low …… and shall be insoluble in water.	Material description Specifications: Composition: Low …… and shall be insoluble in water. **Contractor can proceed with alternative constructive solutions, listed by Approved Laboratory or Organizations, keeping the same performance level in terms of full risk coverage as per ER (therefore, not covering only the fire risk) and without compromising the installation flexibility post-construction.**

71	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix N Clause No. 4.4	Transfer of Control between TMS & CBI: The Automatic and Manual …….... VDU Display in the SCR When the links ……. Point Locking and Approach Locking, etc.	Transfer of Control between TMS & CBI: The Automatic and Manual …….... VDU Display in the SCR. **In case of failure of both Central TMS and Local TMS, train shall run normally in ATO and ATP/FS mode.** When the links ……... Point Locking and Approach Locking, etc.
72	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix N Clause No. 4.5	Start-up of the Interlocking: When the Interlocking …… and the CBI fails and soon after restarts.	**Not Used.**
73	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix N Clause No. 5.2.1 Point no. i	Colour VDU monitor of 30 inches LED, and a suitable equipment to drive the VDU.	Colour VDU monitor of ~~30~~ **32** inches LED, and a suitable equipment to drive the VDU.
74	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix N Clause No. 7.2.1	Maintenance terminal consisting of a reliable PC from a reputed manufacturer, a VDU terminal, printer, CDROM drive and dedicated keyboard shall be used for following:	Maintenance terminal consisting of a reliable PC from a reputed manufacturer, a VDU terminal, printer, CDROM**/USB** drive and dedicated keyboard shall be used for following:
75	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix O Clause No. 3.11.1	The ATC System ……. at least 2 seconds before the intervention of the full service brake until the actual speed reduces to permitted speed, then the train operator must be capable of selecting release of full service braking. The warning …… emergency brake.	The ATC System …… at least 2 sec. before the intervention of the full-service ~~brake until the actual speed reduces to permitted speed, then the train operator must be capable of selecting release of full service braking~~. **If speed is not controlled within this time, full-service brake shall be applied and get released when the actual speed is reduced to the permitted speed.** The warning …… emergency brake.
76	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix O Clause No. 6.3	Distance and Speed Measurement The ATP system ……. slip or slide. The distance measurement, which may be falsified by sliding and skidding, shall be synchronized regularly. The error in	Distance and Speed Measurement The ATP system ……. slip or slide. The distance measurement, which may be falsified by sliding and skidding, shall be synchronized regularly **through**

<table>
<tr><td></td><td></td><td>the speed measurement due to wear in wheel diameter shall be mitigated by automatic means or other safe methods.</td><td><u>equipment like Accelerometer, Radar etc.</u> The error in the speed measurement due to wear in wheel diameter shall be mitigated by automatic means or other safe methods.</td></tr>
<tr><td>77</td><td>Employer’s Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix O Clause No. 7.4</td><td>The wayside ATP ……CENELEC EN50129:
b. On board ATP/ ATO equipment</td><td>The wayside ATP ……. CENELEC EN50129:
b. On board ATP/ ATO equipment <u>(For MRTS and RRTS trains)</u></td></tr>
<tr><td>78</td><td>Employer’s Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix O Clause No. 7.5</td><td>The train to wayside radio communication network architecture should use radio-based communication system. Failure of single network element viz. Radio Access point, switch, media converter etc. shall not cause any deterioration in ETCS working. The …… deployment in field.</td><td>The train to wayside radio communication network architecture should use radio-based communication system. Failure of single network element including <u>but not limited to BBU, RRU, Backhaul, CPRI, EPC</u> <s>viz. Radio Access point</s>, switch, media converter etc. shall not cause any deterioration in ETCS working. The …… deployment in field.</td></tr>
<tr><td>79</td><td>Employer’s Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix Q,
Add new item at S.No. 16</td><td></td><td><u>[Add the following New item No. 16 in table of Appendix Q of this PS]</u>
<table><tr><th>SN</th><th>Item</th><th>Unit</th><th>Quantity</th></tr><tr><td>16</td><td>Predictive maintenance tool for balise with all accessories</td><td>No.</td><td>1</td></tr></table></td></tr>
<tr><td>80</td><td>Employer’s Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix R,
Clause No. 1.3</td><td><table><tr><th>Stages</th><th>Description</th><th>No. of RRTS/MRTS trains</th><th>No. of maintenance vehicle</th></tr><tr><td>Stage-1</td><td>Sahibabad to Duhai</td><td rowspan="2">RRTS- 30
MRTS-10
(As per Rolling Stock delivery schedule/AD/KD)</td><td rowspan="2">08 (RRV, CMV and RGM)</td></tr><tr><td>Stage-2</td><td>Duhai (Excluding) to Meerut South</td></tr></table></td><td><table><tr><th>Stages</th><th>Description</th><th>No. of RRTS/MRTS trains</th><th>No. of maintenance vehicle</th></tr><tr><td>Stage-1</td><td>Sahibabad to Duhai</td><td rowspan="2">RRTS- 30
MRTS-10
(As per Rolling Stock delivery schedule/AD/KD)</td><td rowspan="2"><s>08</s><u>06 (</u><s>RRV,</s> CMV, <u>Engineer’s Vehicle and RGM)</u></td></tr><tr><td>Stage-2</td><td>Duhai (Excluding) to Meerut South</td></tr></table></td></tr>
</table>

		Stage-3	SKK to Sahibabad (Excluding)			Stage-3	SKK to Sahibabad (Excluding)		
		Stage-4	Meerut South (Excluding) to Modipuram			Stage-4	Meerut South (Excluding) to Modipuram		
81		Interchange Stations with DMRC ` 1). SKK 2). New Ashok Nagar 3). Anand Vihar 4). Sahibabad				**Interchange Stations** **a). Interchange with DMRC `** 1). SKK 2). New Ashok Nagar 3). Anand Vihar 4). Sahibabad **5). Ghaziabad** **b). Interchanges with Indian Railways** **1). Hazrat Nizamudin (Sarai Kale Khan)** **2). Anand Vihar** **c). Interchanges with Bus Stand** **1). Sarai Kale Khan** **2). Anand Vihar** **3). Sahibabad** **4). Bhaisali**			

82	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix S Clause No. 1.2.1	The Signalling and Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm at suitable places for constructing site offices and storage facilities for contractor. The contractor will construct the site office and storage facility within 4 months of possession of land given by NCRTC. The space will be available to the Contractor till end of maintenance contract.	The Signalling and Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm at **each of the two** suitable places for constructing site offices and storage facilities for contractor **as mentioned in Appendix A.** The contractor will construct the site office and storage facility within 4 months of possession of land given by NCRTC. The space will be available to the Contractor till end of maintenance contract.
83	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix S Clause No. 1.2.7	Contractor shall provide and maintain the following requirements for employer as well a) 1 Chamber for employer's engineer of 20 sqm area b) Rooms of 15 sqm area each for DY. HODS c) 1 Room of 30 sqm area for seating 5 Asst Engineers d) 1 Hall of area 50 sqm for seating of supervisors and storage of documents apart from toilet and pantry. This area shall be furnished and air-conditioned. e) 1 Meeting room of 25 sqm area.	Contractor shall provide and maintain the following requirements for employer ~~as well~~ **at each site office** a) 1 Chamber for employer's engineer of 20 sqm area b) **2** Rooms of 15 sqm area for DY. HODS c) 1 Room of 30 sqm area for seating 5 Asst Engineers d) 1 Hall of area 50 sqm for seating of **10** supervisors and storage of documents apart from toilet and pantry. ~~This area shall be furnished and air-conditioned.~~ e) 1 Meeting room of 25 sqm area. **Area mentioned above shall be furnished (including furniture, storage almirahs etc. excluding workstations) and air-conditioned.**
84	Employer's Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix V, KEY & ACCESS DATES	The existing Appendix V: Key dates has been Revised. The revised **Appendix V: KEY & ACCESS DATES R1** is attached herewith as **Attachment no. 2** in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.	
85	Employer's Requirement Part-2, Section 6F, General Alignment Drawing	The General Alignment Drawing is attached herewith as **Attachment No. 3** in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.	
86	Employer's Requirement Part-2, Section 6E, Safety, Health and Environment (SHE)	The existing Safety, Health and Environment (SHE) has been Revised. The revised **Section 6E_Condition of Contract on safety, Health and Environment (SHE) along with correction slip** is attached herewith as **Attachment no. 6** in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.	

87	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 9.4 List of Interface sheets for S&T	Note: Package reference code like PST, UGC, EAG ,… are only indicative and may change in due course.	Note: Package reference code like PST, UGC, EAG ,… are only indicative and may change in due course. **Term "S&T Contractor" and "Package 24 Contractor" to be used interchangeably.**
88	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 1.Signalling & Telecommunication (S&T) and UG Stations and Tunnel Contractor.28	Shall request space for installation of SMPS. / Shall provide space to S&T contractor for the same and required input supply to SMPS.	**Shall Supply, Install, Test and Commission SMPS, if required.** Shall request space for installation of SMPS. / **Shall provide space to S&T contractor for the same.**
89	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 6.S&T Vs Track Works Contractor		**[Add the following at the end of 6.S&T Vs Track Works Contractor]** **Note: -** **- For item no. 19 above, one mock up shall be done for each type of turnout.** **- Point machine supplied for mock up can be reused by S&T contractor as Spare for DLP/T&C after providing the same along with "Certificate/Fitness for train operation"**
90	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 7.S&T (Signalling) Vs DEPOT 18	Shall request space for installation of SMPS. / Shall provide space to S&T contractor for the same and required input supply to SMPS.	**Shall Supply, Install, Test and Commission SMPS, if required.** Shall request space for installation of SMPS. / **Shall provide space to S&T contractor for the same.**

91	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 7.S&T (Signalling) Vs DEPOT 23	Shall jointly check the earthing works and earth bus in the Technical S&T rooms required for systems. Earthing connection from MET/CET to S&T equipment.	Shall install earths and earth bars for S & T equipments for various systems and terminate inside the main equipment rooms, DCC, and for earthing of line side signaling and Telecommunication systems(if required). All the earthing works shall be made ready and handed over to S&T.	Shall jointly check the earthing works and earth bus in the Technical S&T rooms required for systems. Earthing connection from MET/CET to S&T equipment. **For signalling outdoor equipments in "Depot/yard area", Signalling Contractor shall install earth pits and earthing cables & connections to Signalling outdoor equipments.**	**Shall install earths and earth bars for S & T equipments for various systems and terminate inside the main equipment rooms, DCC. All the earthing works shall be made ready and handed over to S&T.**
92	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 7.S&T (Signalling) Vs DEPOT 26	The S&T contractor will be provided a space of about 1500 sqm at suitable places for constructing permanent site offices and storage facilities for contractor as well as employer's engineer in each depot.	Shall provide required space.	The Signalling contractor will be provided a space of about **1200 sqm at each of the two suitable places** for constructing permanent site offices and storage facilities for contractor as well as employer's engineer **along the D-G-M corridor.**	Shall provide required space **at each of the two suitable places along the D-G-M corridor.**
93	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 8.S&T (Telecom) Vs DEPOT 17	Shall request space for installation of SMPS.	Shall provide space to S&T contractor for the same and required input supply to SMPS.	**Shall Supply, Install, Test and Commission SMPS, if required.** Shall request space for installation of SMPS.	**Shall provide space to S&T contractor for the same.**

94	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 8.S&T (Telecom) Vs DEPOT 18	Shall jointly check the earthing works and earth bus in the Technical S&T rooms required for systems. Earthing connection from MET/CET to S&T equipment.	Shall install earths and earth bars for S & T equipments for various systems and terminate inside the main equipment rooms, and for earthing of line side signaling and Telecommunication systems(if required). All the earthing works shall be made ready and handed over to S&T.
		Shall jointly check the earthing works and earth bus in the Technical S&T rooms required for systems. Earthing connection from MET/CET to S&T equipment. **For telecom outdoor equipments in "Depot/yard area", Telecom Contractor shall install earth pits and earthing cables & connections to Telecom outdoor equipments.**	**Shall install earths and earth bars for S & T equipments for various systems and terminate inside the main equipment rooms. All the earthing works shall be made ready and handed over to S&T.**
95	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 8.S&T (Telecom) Vs DEPOT		**[Clause 25 added]**
		The Telecom contractor will be provided a space of about 600 sqm at each of the two suitable places for constructing permanent site offices and storage facilities for contractor as well as employer's engineer along the D-G-M corridor.	**Shall provide required space at each of the two suitable places along the D-G-M corridor.**

96	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 9. S&T Vs. Elevated stations - MEF (& Arch Finishes) Contractor16	Shall request space for installation of SMPS. / Shall provide space to S&T contractor for the same and required input supply to SMPS.	**Shall Supply, Install, Test and Commission SMPS, if required.** Shall request space for installation of SMPS. / **Shall provide space to S&T contractor for the same.**
97	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 10.S&T, PSD Vs Rolling Stock Item 1 to 10	**[Clause under Rolling Stock]** To provide space in the vehicle design for fixing and installation at the manufacturer's facility, by the Rolling Stock Contractor, under the supervision of the S&T Contractor. The speed measuring sensor and odometer for non-signalling mode will be provided by Rolling Stock Contractor. To provide train lines/Ethernet Connection as per S&T requirement.	**[Clause under Rolling Stock]** To provide space in the vehicle design for fixing and installation at the manufacturer's facility, by the Rolling Stock Contractor, under the supervision of the S&T Contractor. The speed measuring sensor and odometer for non-signalling mode will be provided by Rolling Stock Contractor. **(S.no. 9)** To provide train lines/Ethernet Connection as per S&T requirement. **(S.no. 8)**
98	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 10.S&T, PSD Vs Rolling Stock 46.Modes of train operation	All the ETCS modes (as applicable) including ATO over ETCS (AoE) GoA2 & Automatic Turn Back (ATB) / Shall interface with signaling to decide mode selector position.	**All the ETCS modes (as applicable) including ATO over ETCS (AoE) GoA2** / Shall interface with signaling to decide mode selector position.
99	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control Appendix-A 10.S&T, PSD Vs Rolling Stock		**[Add the following at the end of 10.S&T, PSD Vs Rolling Stock]** **NOTE: -** **a) Complete train (AW0 & AW3) shall be subjected to Wheel slip-slide type test as per UIC 541-05.** **b) For trains in Depots-– S&T Contractor shall only**

			provide wi-fi coverage and a link between TCMS and TCMS server. TCMS and Automated wayside wheel profile measurement are in the Rolling Stock scope. **c) Terms "Executive Coach" and "Business Coach/Class" are used interchangeably.** **d) Train Configuration** **The Trainset formation shall generally be as follows:** **3 Car Train formation (MRTS): *DEC-NDEC-DEC*** **3 Car Unit for RRTS: DBC-NDEC-NDEC or DEC-NDEC-NDEC** **6 Car Train formation (RRTS): *DBC-NDEC-NDEC=NDEC-NDEC-DEC*** **Where;** **DBC-Driving Business Class Car** **NDEC-Non-Driving Economy Class Car** **DEC: Driving Economy Class Car** *** End Automatic Couplers having mechanical and pneumatic coupling** **– Semi-permanent couplers** **= Intermediate Auto Couplers with Electrical head** **In case of 9 Car formation in future, the performance features of extra 3 Car unit shall be suitably designed in accordance with the design of the RRTS Rolling Stock would be such that if need be in future, it shall be possible to integrate a similar intermediate 3-car unit (without driver's cab) with 67% motoring and convert it into a 9-car trainset.** **The front couplers shall be capable of connecting two trains mechanically and pneumatically for rescue only.** **e) Door Passage per car: - For "Business Class" - 2 & For "Economy Class" - 3**

<table>
<tr><td></td><td></td><td></td><td>f) For detail on “Wi-Fi access points with antenna (02 per cab), if required”, kindly refer Appendix Q of Section 6C.</td></tr>
<tr><td>100</td><td>Employers Requirement Part-2, Section 6B: PS-Signalling and Train control
Appendix-A
11.S&T Vs OPE Contractor</td><td colspan="2">[Replace 11. S&T Vs OPE Contractor by the following]
<u>11. S&T Vs OPE (Operation and Maintenance Contractor)</u>
<table>
<tr><th><u>S&T Contractor</u></th><th><u>Operation and Maintenance Contractor</u></th><th><u>Sheet #: 1/1</u></th></tr>
<tr><td><u>S&T Contractor</u></td><td><u>Design Stage</u></td><td><u>OPE Contractor</u></td></tr>
<tr><td><u>Nil</u></td><td colspan="2"><u>Nil</u></td></tr>
<tr><td><u>S&T Contractor</u></td><td><u>Installation Stage</u></td><td><u>OPE Contractor</u></td></tr>
<tr><td><u>Nil</u></td><td colspan="2"><u>Nil</u></td></tr>
<tr><td><u>S&T Contractor</u></td><td><u>Test & Commissioning Stage</u></td><td><u>OPE Contractor</u></td></tr>
<tr><td><u>1. Shall conduct the training courses for NCRTC personnel and OPE Contractor’s personnel or any personnel nominated by NCRTC.</u>
<u>2. Shall lead the integrated Testing and Commissioning phase.</u>
<u>3. Shall assist the OPE Contractor in Trial run period.</u></td><td colspan="2"><u>1. Shall make available the qualified personnel for the training courses conducted for NCRTC personnel and OPE Contractor’s personnel</u>
<u>2. The relevant personnel shall attend the integrated Testing and Commissioning phase;</u>
<u>3. Shall operate the Trial Run.</u></td></tr>
<tr><td><u>S&T Contractor</u></td><td><u>Maintenance Stage</u></td><td><u>OPE Contractor</u></td></tr>
<tr><td colspan="3"><u>Obligations of S&T Contractor towards the Employer for Operations and Maintenance shall be transferred to OPE Contractor.</u>
<u>To the extent warranties/DLP under the S&T Contract will be assigned to the OPE Contractor, who will be responsible for taking relevant action against the S&T Contractor on behalf of the Employer and ensuring rectification of the defects.</u>
<u>Also, the OPE Contractor shall assist the Employer in taking action against the S&T Contractor.</u></td></tr>
</table></td></tr>
</table>

<table>
<tr><td>101</td><td>Employers Requirement Part-2, Section 6B: PS-Signalling and Train control
Appendix-A
12.S&T (Signalling) Vs PSD Contractor16</td><td></td><td>[Clause 16 added]
<table><tr><td><u>Shall supply, test, install and commission PSD simulator for test track.</u></td><td><u>Shall interface for PSD simulator for test track and coordinate with Signalling Contractor. No physical PSD to be provided/installed at test track.</u></td></tr></table></td></tr>
<tr><td>102</td><td>Employers Requirement Part-2, Section 6B: PS-Signalling and Train control
Appendix-A
16.S&T Vs Maintenance Vehicle Contractor</td><td></td><td>[Add the following at the end of 16.S&T Vs Maintenance Vehicle Contractor]

<u>Note:</u>
<u>- The maintenance vehicle shall be capable of fitment of ETCS level 1 and 2 based Signalling & Train control system (without ATO) planned for RRTS project.</u>
<u>- Key dates shall be provided at later stage.</u>

<u>- Performance requirements for Engineer’s Vehicle, RGM/RGV, CMV will provided at later stage. (if required)</u></td></tr>
<tr><td>103</td><td>Employers Requirement Part-2, Section 6B: PS-Signalling and Train control
Appendix-A
19. S&T Vs. OCC Contractor
15</td><td><table><tr><td>Shall request space for installation of SMPS.</td><td>Shall provide space to S&T contractor for the same and required input supply to SMPS.</td></tr></table></td><td><table><tr><td><u>Shall Supply, Install, Test and Commission SMPS, if required.</u>
Shall request space for installation of SMPS.</td><td><u>Shall provide space to S&T contractor for the same.</u></td></tr></table></td></tr>
<tr><td>104</td><td>Employers Requirement Part-2, Section 6A: GS-Signalling and Train control</td><td>The quantity of Contract Spares for repairable item shall be determined in accordance with the following formula;</td><td>The quantity of Contract Spares for repairable item shall be determined in accordance with the following formula;</td></tr>
</table>

	13.3.6	$P\ (o\text{-}r) = \sum_{c=0}^{r} \frac{(nft)^{c} * e^{-nft}}{c!}$ (1) f is the failure rate (failures per hour); (2) n is the population of the item in the Permanent Works; (3) r is the number of Contract Spares to be supplied; and (4) t is the time for turn around of the item by the Contractor (expressed in hours).	$P\ (o\text{-}r) = \sum_{c=0}^{r} \frac{(nft)^{c} * e^{-nft}}{c!}$ (1) f is the failure rate (failures per hour); (2) n is the population of the item in the Permanent Works; (3) r is the number of Contract Spares to be supplied; and (4) t is the time for turn around of the item by the Contractor (expressed in hours). (5) **(6)** c is the number of failures
105	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 2.3.5	Temporary Operation Control Centre shall be provided at same station for the train operation requirement.	Temporary Operation Control Centre **with all functions similar to OCC** shall be provided at same station for the train operation requirement. **These equipment can be reused**.
106	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.13.5.2.	Flexibility and Maintainability (1) Unique database management for both traffic and maintenance purposes. (2) Territory distributed system; (3) Configurability and expandability of the system; (4) Modular and standardized architecture;	Flexibility and Maintainability (1) Unique database management for both traffic and maintenance purposes. (2) Territory distributed system; (3) Configurability and expandability of the system; (4) Modular and standardized architecture;

		(5) Self-diagnosis functions; (6) Commercial basic hardware and software; (7) Open standard system for interoperability.	(5) Self-diagnosis functions; (6) Commercial basic hardware and software; (7) Open standard system for interoperability. **Refer list of standards/specifications of PS.**
107	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.13.5.3.	Efficiency a. Automation of management processes; • Alarm management • Event management • Crew management • Train Tracking management • Boundary Management • Shunting Area (SA) • Disruption management • Multi-User Management • Configuration Management • Rolling stock Management b. Simplification of procedures; c. High reliability, sustainability and availability	Efficiency **(It deals with simplification of the operational procedures in case of normal, disrupted, degraded operation).** a. Automation of management processes; • Alarm management • Event management • Crew management • Train Tracking management • **Not used** ~~Boundary Management~~ • Shunting Area (SA) • Disruption management • Multi-User Management • Configuration Management • Rolling stock Management b. Simplification of procedures; c. High reliability, sustainability and availability

108	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.14	FUNCTIONAL ARCHITECTURE of CCS From a logical and functional point of view, the CCS system shall carry out the following macro – functions but not limited to: (1) Centralized Traffic Management functions (CTMS); (2) Diagnostic & Maintenance Management; (3) Power supply and Traction system Management (4) Passenger Information; (5) Video Surveillance and security system; (6) Emergency management (tunnel ventilation system) (7) CCS personnel training & Simulation facilities. (8) Quality of service reports (9) Access control and Intrusion Detection system (10) Distributed Acoustic System (11) Playback system These functions shall be performed at two levels (OCC/BCC and Peripheral /Local Control).	FUNCTIONAL ARCHITECTURE of CCS From a logical and functional point of view, the CCS system shall carry out the following macro – functions but not limited to: (1) ~~Centralized~~ Traffic Management ~~functions~~ **System** (~~C~~TMS); (2) Diagnostic & Maintenance Management; (3) Power supply and Traction system Management (4) Passenger Information; (5) Video Surveillance and security system **(CCTV System)**; (6) Emergency management (tunnel ventilation system) (7) CCS personnel training & Simulation facilities. (8) Quality of service reports (9) Access control and Intrusion Detection system **(No interface with TMS)** (10) Distributed Acoustic System **(provided by other Contractor for Interface with TMS for Alarms)** (11) Playback system ~~These functions shall be performed at two levels (OCC/BCC and Peripheral /Local Control).~~
109	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.15.1.	The Central Traffic management system shall be implemented through CTMS (Centralized Traffic Management) and TMS (Traffic management system)	The ~~Central~~ Traffic management **system is the system for all train monitoring, controlling and planning activities at central location.** ~~shall be implemented through CTMS (Centralized Traffic Management) and~~

		system. Operator shall utilize all functions of CTMS and TMS for train operation.	~~TMS (Traffic management system) system. Operator shall utilize all functions of CTMS and TMS for train operation.~~
110	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.16(3)	(3). Data shall be provided from future corridor TMS in a format required by CTMS.	(3) **Not used**. Data ~~shall be~~ provided from future corridor TMS. ~~in a format required by CTMS.~~
111	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.16.4.	The Train Control and Signalling System shall provide commands to disable automatic route setting on specific routes, specific IXL and for specific train and manually set routes in various modes. The following modes shall be available for route setting: (1) Fleet and manual modes (including shunt route setting); and (2) Sequence mode for turnarounds.	The Train Control and Signalling System shall provide commands to disable automatic route setting on specific routes, specific IXL and for specific train and manually set routes in various modes. The following modes shall be available for route setting: (1) Fleet and manual modes (including shunt route setting); and (2) Sequence mode **(Cycle)** for turnarounds.
112	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.16.6	The ARS function shall be supported by a comprehensive set of commands giving the Traffic controller high operational flexibility to deal with scenario in normal and degraded mode. As a minimum, the ARS commands shall allow the operator to Enable/Disable ARS for the whole ARS area, an ARS sub-area, a particular train or a particular signal.	The ARS function shall be supported by a comprehensive set of commands giving the Traffic controller high operational flexibility to deal with scenario in normal and degraded mode. As a minimum, the ARS commands shall allow the operator to Enable/Disable ARS for the whole **Corridor, IXL area,** ~~ARS area, an ARS sub-area,~~ a particular train or a particular signal.
113	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.16.8.	The ARS initiation point (or trigger point) that trigger ARS in sending the command shall be based on the booking time calculated by the TMS: this permits to open the route with respect of the effective speed of a train “blocking” this route for a minimal time.	The ARS initiation point (or trigger point) that trigger ARS in sending the command shall be based on the booking time calculated by the TMS: this permits to open the route with respect of the effective speed of a train “blocking” this route for a minimal time. **(The booking time is the calculated duration for a train to cover the distance**

			between its actual position and the starting of the route).
114	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.16.9.	During reverse running the Train Describer facility shall be available and the movement of train running in reverse direction shall be followed by TMS without automatic route setting.	During reverse running the Train Describer facility shall be available and the movement of train running in reverse direction shall be followed by TMS without automatic route setting. **Reverse running definition as per Clause 3.3 of Appendix D**
115	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.17.1.	The CTMS/TMS shall monitor the progress of trains along the Track in real time to the level of resolution provided by the train detection. Train detection data shall be available to TMS from IXL and RBC. The TDS (Train Describer system) function shall be used to identify the Train on track and it shall be alphanumeric digits.	The ~~CTMS/~~TMS shall monitor the progress of trains along the Track in real time to the level of resolution provided by the train detection. Train detection data shall be available to TMS from IXL and RBC. The TDS (Train Describer system) function shall be used to identify the Train on track and it shall be alphanumeric digits.
116	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.17.2.	The Train id allocation shall be automatic assigned: - (1) Based on the Departure time/Station/Platform of the Timetable (2) Received by Adjacent TMS/System	The Train id allocation shall be automatic assigned: - (1) Based on the Departure time/Station/Platform of the Timetable **available in Central TMS or,** (2) ~~Received by~~ **From** Adjacent TMS, (3) **From third party integrated Timetable management system.**
117	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.17.3.	Manual Train id allocation shall also be allowed to the train and shall be associated with the current timetable and system shall verify that no other train with same number is running on the section. The system shall give warning in the situation of unavailability of such id in timetable.	Manual Train id allocation shall also be allowed to the train **from Central TMS** and shall be associated with the current timetable and system shall verify that no other train with same number is running on the section. The system shall give warning in the situation of unavailability of such id in timetable.

118	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.17.7.	During switchover from Central TMS to Local/Peripheral TMS or from one TMS server to the redundant TMS server there should not be any loss of Train ID. The operator shall be able to assign, delete, replace, change and edit the Train Id /Rake id from TMS MMI and TMS shall verify from CTMS.	During switchover from Central TMS to Local/Peripheral TMS or from one TMS server to the redundant TMS server there should not be any loss of Train ID. The operator shall be able to assign, delete, replace, change and edit the Train Id /Rake id from **Central** TMS MMI ~~and TMS shall verify from CTMS.~~
119	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.17.8.	It shall not be possible to assign same Id to two different trains in entire network controlled by CTMS or peripheral TMS.	It shall not be possible to assign same Id to two different trains in entire **corridor.** ~~network controlled by CTMS or peripheral TMS.~~
120	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.18.1.1.	CTMS system shall be consisted of prebuild Regulation strategies for train regulation in case of delay which shall be called as Automatic Train Regulation. These strategies shall be implemented by CTMS through TMS. The major function of ATR should be as below, (1) Regulate Schedule (2) Regulate Constant Headway	~~C~~TMS system shall be consisted of prebuild Regulation strategies for train regulation in case of delay which shall be called as Automatic Train Regulation. ~~These strategies shall be implemented by CTMS through TMS.~~ The major function of ATR should be as below, (1) Regulate Schedule (2) Regulate Constant Headway
121	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.18.2.2.	Schedule(timetable) Adherence only: Only schedule Regulation is active. 1. In timetable regulation mode, the ATR algorithm shall regulate trains to schedule to minimise overall delay with respect to the timetable. 2. In timetable regulation mode, the ATR algorithm shall regulate trains to schedule to minimise overall delay with respect to the timetable. 3. The ATR shall maintain the timetable sequence of trains.	Schedule(timetable) Adherence only: Only schedule Regulation is active. 1. In timetable regulation mode, the ATR algorithm shall regulate trains to schedule to minimise overall delay with respect to the timetable. 2. **Not used.** ~~In timetable regulation mode, the ATR algorithm shall regulate trains to schedule to minimise overall delay with respect to the timetable.~~ 3. The ATR shall maintain the timetable sequence of trains.

		4. When ATR timetable mode is selected, a train is considered early/late if it is operating outside of a time window which shall be user configurable. If a train is early or late then the ATR shall regulate the train to timetable using the following two ATR functions: • Train performance regime adjustment to meet the scheduled arrival time at the next station; and • Station dwell optimization. 5. The Schedule regulation strategy should include accelerate, slowdown, dwell time calculation and optimization, Change Shunting, Suppression of running rolling stock Usage of reserve rolling stock, use of minimum dwell time and speed.	4. When ATR timetable mode is selected, a train is considered early/late if it is operating outside of a time window which shall be user configurable. If a train is early or late then the ATR shall regulate the train to timetable using the following two ATR functions: • Train performance regime adjustment to meet the scheduled arrival time at the next station; and • Station dwell optimization. 5. The Schedule regulation strategy should include accelerate, slowdown, dwell time calculation and optimization, Change Shunting, Suppression of running rolling stock Usage of reserve rolling stock, use of minimum dwell time and speed.
122	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19	TMS Functions Following functions shall be performed by CTMS & TMS/LTMS but not limited to:- (1) Monitoring of signalling gears & equipment (2) Control of signalling equipment (3) Inter-station stop detection management (4) TMS train hold management (5) Skip stop station management (6) TSR management (7) Platform hold and release	TMS Functions Following functions shall be performed by ~~CTMS &~~ TMS~~/LTMS~~ but not limited to: - (1) Monitoring of signalling gears & equipment (2) Control of signalling equipment (3) Inter-station stop detection management (4) ~~TMS t~~**T**rain hold management (5) Skip stop station management (6) TSR management (7) Platform hold and release

		(8) System hold and release (9) TMS sub-system supervision (10) Alarms & Events management (11) Train Dispatch (12) Train detection and train follow-up (13) Axle Counter management (14) Train identifier (15) PTI management (16) Automatic route setting (17) Playback management (18) Training Simulator and Trainee positions (19) Change of ends request (20) Passenger information management (21) Operating System Administration (22) Man Machine Interface (MMI) (23) Delay distribution management (24) Network Monitoring system (25) Rolling stock management (26) Implementing Wet and dry profile	(8) System hold and release (9) TMS sub-system supervision (10) Alarms & Events management (11) Train Dispatch (12) Train detection and train follow-up (13) **Not used** ~~Axle Counter management~~ (14) Train identifier (15) **Not used** ~~PTI management~~ (16) Automatic route setting (17) Playback management (18) Training Simulator and Trainee positions (19) Change of ends request (20) Passenger information management (21) Operating System Administration (22) Man Machine Interface (MMI) (23) Delay distribution management (24) Network Monitoring system (25) Rolling stock management (26) ~~**Not used**~~ ~~Implementing Wet and dry profile~~

		(27) Delays and departure/arrival times of scheduled trains management (28) Dwell and inter-station running times management (29) On line & offline timetable management (30) TDG (31) Quality of service	(27) Delays and departure/arrival times of scheduled trains management (28) Dwell and inter-station running times management (29) On line & offline timetable management (30) TDG (31) Quality of service
123	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.1.2.	TMS shall continuously update the status of all trains to CTMS server for timetable management.	**Not used**. ~~TMS shall continuously update the status of all trains to CTMS server for timetable management.~~
124	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.7	Online /offline Time Table management 5.19.7.1. CTMS system shall be capable and provide a system to manage Timetable Online along with Offline management. User can modify the Timetable online. After the modification CTMS shall calculate the future prediction of train movement which shall be named as reforecasting. 5.19.7.2. Reforecasting management function shall be CTMS functionality. The CTMS system shall be capable to forecast the future trip of the train in online timetable, calculating the arrival and departure time in each resource (route, platform and block section).This prediction shall be the input for the Conflict Detection function. The main goal of this functionality shall be to give the best estimation of the future trip of any train as much as possible adherent to the reality. It shall permit to the Users (and the system itself) to see in advance the future status of the train	Online /offline Time Table management 5.19.7.1. ~~C~~TMS system shall be capable and provide a system to manage Timetable Online along with Offline management. User can modify the Timetable online. After the modification ~~C~~TMS shall calculate the future prediction of train movement which shall be named as reforecasting. 5.19.7.2. Reforecasting management function ~~shall be CTMS functionality.~~ **:-**The ~~C~~TMS system shall be capable to forecast the future trip of the train in online timetable, calculating the arrival and departure time in each resource (route, platform and block section).This prediction shall be the input for the Conflict Detection function. The main goal of this functionality shall be to give the best estimation of the future trip of any train as much as possible adherent to the reality. It shall permit to the Users (and the system itself) to see in advance the future status of the train

		5.19.7.3. Online modification shall not modify the offline timetable. 5.19.7.4. That offline and online timetable system shall be capable of extension of more future corridors of NCRTC to prepare a central common timetable of all CORRIDORS.	5.19.7.3. Online modification shall not modify the offline timetable. 5.19.7.4. **Not used** ~~That offline and online timetable system shall be capable of extension of more future corridors of NCRTC to prepare a central common timetable of all CORRIDORS.~~
125	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.8.2.(7)	Temporary speed restrictions shall be capable of being imposed over any track segment based on selection of kilometric points on complete line.	Temporary speed restrictions shall be capable of being imposed over any track segment **of maximum length 250 m** based on selection of kilometric points on complete line.
126	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.10.2.	The TMS sub-system is divided into three categories: (1) Category 1: Communication with other signalling systems & Local signalling operation. Automatic signalling operation from Local TMS server at station. (2) Category 2: Central Operation: Communication with other signalling systems and Automatic signalling operation from TMS & CTMS server at OCC. (3) Category 3: Off-line operation (4) Category 1 shall be composed of Local Redundant LAN, Redundant server(s), Field Interfaces and Operator workstations. Interface between software components of Category 1 and external sub-systems shall include Local TMS Server to IXL, Local TMS server to RBC & ATO. (5) The TMS sub-system component of Category 2 shall be composed of WAN, Local Redundant LAN at OCC, Redundant server and Operator workstation. Will make use of optical fibre cables as detailed in PS 5.42. TMS at	The TMS sub-system is divided into three categories: (1) Category 1: Communication with other signalling systems & Local signalling operation. ~~Automatic s~~**S**ignalling operation from Local TMS server at station. (2) Category 2: Central Operation: Communication with other signalling systems and Automatic signalling operation from TMS ~~& CTMS~~ server at OCC. (3) Category 3: Off-line operation (4) Category 1 shall be composed of Local Redundant LAN, Redundant server(s), Field Interfaces and Operator workstations. Interface between software components of Category 1 and external sub-systems shall include Local TMS Server to IXL, Local TMS server to RBC & ATO. (5) The TMS sub-system component of Category 2 shall be composed of WAN, Local Redundant LAN at OCC, Redundant server and Operator workstation. Will make use of optical fibre cables as detailed in PS 5.42. TMS at

		Central also communicate with external sub-systems like IXL, ATO, RBC & ON BOARD. (6) Interface between software components of Category 2 and external sub-systems shall include Central server to Radio System, Central server to PA/PIDS, Central server to Operational overview screens, Central server to Master clock system, Central server to SCADA, Central Server to Distributed acoustic system (in future), (7) The TMS sub-system component of Category 3 shall be composed of: (a) Off-line Redundant LAN (b) Off-line redundant servers (c) Off-line workstations (d) Playback system (e) Training Simulator	Central also communicate with external sub-systems like IXL, ATO, RBC & On board. (6) Interface between software components of Category 2 and external sub-systems shall include Central server to Radio System, Central server to PA/PIDS, Central server to Operational overview screens, Central server to Master clock system, Central server to SCADA, Central Server to Distributed acoustic system ~~(in future),~~ (7) The TMS sub-system component of Category 3 shall be composed of **following workstations to work as standalone system:** (a) Off-line Redundant LAN (b) Off-line redundant servers (c) Off-line workstations (d) Playback system (e) Training Simulator
127	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.14.	5.19.4 Not used.	5.19.4 ~~Not used~~. **Train detection and follow up:- Train follow-up shall be executed by TMS checking the proper sequence of occupied/clear of the block sections.**
128	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.19.	Implementing wet and dry conditions: -	**Not used** ~~Implementing wet and dry conditions: -~~
129	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.19.1	TMS shall be capable to allow operator to apply “dry” or “wet” condition of track that shall be communicated to train to act accordingly. The operator shall have the option to	**Not used** ~~TMS shall be capable to allow operator to apply “dry” or “wet” condition of track that shall be communicated to train to act accordingly. The operator~~

		apply such condition on any track section particularly in open area.	~~shall have the option to apply such condition on any track section particularly in open area.~~
130	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.20.2 & 5.19.20.3	5.19.20.2 The CTMS shall provide junction management for all merging and diverging junctions. 5.19.20.3 The CTMS shall provide for the following junction management modes: (1) First come first serve (2) Priority for late trains (3) Priority for selected Trains (4) Individual trains at particular junction Priority for selected routes.	5.19.20.2 The ~~C~~TMS shall provide junction management for all merging and diverging junctions. 5.19.20.3 The ~~C~~TMS shall provide for the following junction management modes: (5) First come first serve (6) Priority for late trains (7) Priority for selected Trains (8) Individual trains at particular junction Priority for selected routes.
131	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.21.1.	Offline and online Timetable management system shall be done by TMS server. as mentioned in Appendix D. This server shall have both offline and online timetable management workstations. TMS server and both offline/online workstation shall be designed with the feature of imposing future corridors in this existing system for the central timetable management of all corridors.	Offline and online Timetable management system shall be done by TMS server~~.~~ as mentioned in Appendix D. This server shall have both offline and online timetable management workstations~~. TMS server and both offline/online workstation shall be designed with the feature of imposing future corridors in this existing system for the central timetable management of all corridors.~~
132	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.21.5.4.	Types of Trains in Timetable The timetable compilation and proving system shall provide the facility for scheduling train paths for the following train types: 1. Different EMU consists (RRTS/MRTS); 2. Empty rake 3. Freight	Types of Trains in Timetable The timetable compilation and proving system shall provide the facility for scheduling train paths for the following train types: 1. Different EMU consists (RRTS/MRTS); 2. Empty rake 3. Freight

		4. Accidental relief 5. Engineers Train	4. ~~Accidental relief~~ 5. ~~Engineers Train~~
133	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.19.21.7.2.		**[Add the following new note to Clause No. 5.19.21.7.2 in PS]** **NOTE:- The functionality is to be used for the management of time difference between two approaching trains at the station with different destinations where interchange for the passenger from one to another. Idea is to providing convenient interchange.**
134	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.20.4,5.20.6	5.20.4. TMS shall communicate with SCADA for stopping of trains in tunnel section and for input of availability of traction power. 5.20.6. TMS shall communicate with RADIO for PTI.	5.20.4. TMS shall communicate with SCADA for stopping of trains in tunnel section ~~and for input of availability of traction power.~~ 5.20.6. **Not used** ~~TMS shall communicate with RADIO for PTI.~~
135	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.21.3(4).	4. Logging of all events and alarms	4. Logging of all events and alarms **for at least a month**
136	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.21.5.	Diagnostic and Maintenance of all installations, including all diagnostic activities, on-line and forecast activities, related to all apparatus, devices, systems laid on trackside and in the various local locations as follows: (1) Signalling equipment including Platform screen doors and Hot axel detection system; (2) Onboard ATP, RBC & ATO.	Diagnostic and Maintenance of all installations, including all diagnostic activities, on-line and forecast activities, related to all apparatus, devices, systems laid on trackside and in the various local locations as follows: (1) Signalling **IXL** equipment including Platform screen doors and Hot axel detection system; (2) Onboard ATP, RBC & ATO.

137	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.21.6.	Diagnostic and Maintenance of the Centralized Control System, that mainly concerns the diagnostic of the electronic apparatus of CTMS & TMS and their software.	**Not used** ~~Diagnostic and Maintenance of the Centralized Control System, that mainly concerns the diagnostic of the electronic apparatus of CTMS & TMS and their software.~~
138	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.21.7.		**[Add the following New Sub Clause No. 5.21.7 in Clause No. 5.21 in PS]** **5.21.7. Diagnostic and maintenance terminal is for locating defect and alarms in other system from remote location. Maintenance MMI shall be used for alarms and events management of TMS system.**
139	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.22.1	5.22.1 Functions, posts, HW and tools related to such functions are under the scope of the PST (Power Supply & Traction System Contractor).	**5.22.1 Not used.** ~~Functions, posts, HW and tools related to such functions are under the scope of the PST (Power Supply & Traction System Contractor).~~
140	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.22.2	5.22.2 It is in the scope of the S&T Contractor to gather the information from the PST central sever to display on operational screen both in OCC and in BCCs.	5.22.2 **Not used**~~. It is in the scope of the S&T Contractor to gather the information from the PST central sever to display on operational screen both in OCC and in BCCs.~~
141	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.22.3	5.22.3. S&T contractor shall also arrange a dynamic information about availability/tripping of OHE supply. In case of OHE unavailability information will be conveyed to TMS. Unavailability of OHE shall make all train to stop before entering the non-OHE section.	5.22.3. **Not used**. ~~S&T contractor shall also arrange a dynamic information about availability/tripping of OHE supply. In case of OHE unavailability information will be conveyed to TMS. Unavailability of OHE shall make all train to stop before entering the non-OHE section.~~
142	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.22.4.	S&T contractor shall also coordinate with PST contractor to gather information about location of OHE mast superimposed on Signalling layout.	S&T contractor shall also coordinate with PST contractor to gather information about location of OHE mast superimposed on Signalling layout **incorporated in the**

			form of lookup table to find the exact location in section with reference to OHE mast number.
143	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No.5.23.	Passenger Information System	Passenger Information System **(PIDS/PAS)**
144	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.24.	Video surveillance and security system function 5.24.1. The Video Surveillance System signifies the view of train CCTV images in OCC. This function will enable the remote monitoring of Train Saloon and coaches. The OCC will collect images from peripheral video cameras in train. Please refer clause 5.41.	Video surveillance and security system function 5.24.1. The Video Surveillance System **signifies the view of train CCTV images in OCC. This function** **signifies the view of train CCTV images in OCC. This function** will enable the remote monitoring of Train Saloon and coaches. The OCC will collect images from peripheral video cameras in train. Please refer clause 5.41.
145	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.27(2).	Quality Of service (2) Operation report	Quality Of service (2) ~~Operation report~~ **Not Used**
146	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.27.3	Filtration shall be possible in reports for analysis.	Filtration shall be possible in reports for analysis **in every possible parameter**.
147	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.27.4		**[Add the following New Sub Clause No. 5.27.4 in Clause No. 5.27 in PS]** **5.27.4 The all above mentioned reports shall always be available and can be utilized in case of any major disruption in timetable due to any failure for analysis.**

148	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.30.1.4.	The workstation at the Software Development Facilities Centre shall be used for software development. These changes shall only be performed offline.	The workstation at the Software Development Facilities Centre shall be used for software development. **This software development shall include updation of few non-critical and non-vital parameters**. These changes shall only be performed offline **and shall be incorporated to online system when required. These parameters shall be proposed by the contractor for the approval by employer during design stage.**
149	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.30.4.3.	TMS workstation shall be provided at all IXL station with all the functions under authorization of OCC and verbally under OCC authorization upon failure of OCC if it is in operation,	TMS workstation ~~shall be~~ provided at all IXL station with all the functions under authorization of OCC **except Timetable management functions,** ~~and~~ verbally under OCC authorization upon failure of OCC if it is in operation. **Local TMS workstation shall display the Train ID in synchronization with Central TMS and shall retrain those ID in case of Central TMS failure,**
150	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.31.	5.31. Degraded Operation 5.31.1. The TMS system shall ensure central control from Operation Control Centre, local control from each main line Station Control Room, and depot control from Depot Control Centres. The TMS networking shall guarantee the fault tolerance, transfer of controls between control levels, hot redundancy ensuring transparent switchover, TMS scalability and without loss of data.	5.31. Degraded Operation 5.31.1. The TMS system shall ensure central control from Operation Control Centre, local control from each main line Station Control Room, and depot control from Depot Control Centres. The TMS networking shall guarantee the fault tolerance, transfer of controls between control levels, hot redundancy ensuring transparent switchover, TMS scalability and without loss of data.

		5.31.2. Scheduled regulation, Constant Headway regulation, manual regulation shall be available to regulate the train in the event that a failure causes the loss of Central Control functionality. 5.31.3. The CTMS server and TMS sever will hold the timetable for the trains to run as per schedule. The central TMS shall send the actual schedule type for the day to the Local TMS server at each location every morning when the system is started. In this way the trains can run normally, receive dwell, coasting and departure information in the event of failure of central control. If the station is in local operation mode the information handled by the Local TMS shall be sent to the central TMS on restoration of Central Control functionality to keep track of trains. 5.31.4. In case of CTMS failure the TMS shall be able to run the trains in Constant headway mode. 5.31.5. Required TMS functions of central control shall be available for first level of degradation to automatic operation from Local TMS. The local control from the station will the first level of degradation work with schedule regulation, in the second level of degradation in the constant headway mode, in third level of degradation in manual mode from the TMS workstation. 5.31.6. The system will be operated with the interlocking VDU in the event of failure of Local TMS.	5.31.2. **Not used**. ~~Scheduled regulation, Constant Headway regulation, manual regulation shall be available to regulate the train in the event that a failure causes the loss of Central Control functionality.~~ 5.31.3. **Not used** ~~The CTMS server and TMS sever will hold the timetable for the trains to run as per schedule. The central TMS shall send the actual schedule type for the day to the Local TMS server at each location every morning when the system is started. In this way the trains can run normally, receive dwell, coasting and departure information in the event of failure of central control. If the station is in local operation mode the information handled by the Local TMS shall be sent to the central TMS on restoration of Central Control functionality to keep track of trains.~~ 5.31.4. In case **unavailability of Timetable/Schedule mode** of ~~CTMS failure the~~ **Central** TMS shall be able to run the trains in Constant headway mode. 5.31.5. ~~Required TMS functions of central control shall be available for first level of degradation to automatic operation from Local TMS. The local control from the station will the first level of degradation work with schedule regulation, in the second level of degradation in the constant headway mode, in third level of degradation in manual mode from the TMS workstation.~~ **In case of unavailability of Central TMS the control shall be transferred to Local TMS with all functions except timetable management. Local TMS shall be the first level of degradation in event of failure of Central TMS . Local TMS shall retain all the Train ID's already**

			synchronized from Central TMS to keep the track of the trains. Local TMS shall be capable of running trains in constant headway mode in its area of control. In case of failure of both Central TMS and Local TMS, train shall run normally in ATO and ATP/FS mode. **5.31.6. Manual train operation shall always be available with both Central and Local TMS.** 5.31.~~6.~~**7.** The system will be operated with the interlocking VDU in the event of failure of Local TMS.
151	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No 5.33.	5.33. Organizational Model at OCC & BCC 5.33.1. OCC organization is aimed at concentrating all the activities of coordination and control of the operation of the whole NCRTC railway network. Traffic management, rolling stock, traction, signalling and infrastructure supervision in real time are carried out in the Central Control Room named as OCC. 5.33.2. TMS MMI shall be provided to all operators in OCC/BCC for the execution of their designated roles. There are few posts of controllers mentioned below and may vary according to design and requirement. 5.33.3. Operators in OCC 5.33.3.1. Chief Controller 5.33.3.1.1. Master Traffic Controller/Chief Controller will be responsible for overall working of OCC, He will coordinate with all the other controllers in OCC/BCC for all	5.33. Organizational Model at OCC & BCC 5.33.1. OCC organization is aimed at concentrating all the activities of coordination and control of the operation of the whole NCRTC railway network. Traffic management, rolling stock, traction, signalling and infrastructure supervision in real time are carried out in the Central Control Room named as OCC. 5.33.2. TMS MMI shall be provided to all operators in OCC/BCC for the execution of their designated roles. There are few posts of controllers mentioned below and may vary according to design and requirement. 5.33.3. Operators in OCC 5.33.3.1. Chief Controller 5.33.3.1.1. Master Traffic Controller/Chief Controller will be responsible for overall working of OCC, He will coordinate with all the other controllers in OCC/BCC for all

		the information exchange about Train movement and planning.	the information exchange about Train movement and planning.
		5.33.3.1.2. Chief controller shall be provided with CTMS workstation with the view of all integrated corridors on this server This workstation shall display the view of all corridors.	5.33.3.1.2. **Not Used** ~~Chief controller shall be provided with CTMS workstation with the view of all integrated corridors on this server This workstation shall display the view of all corridors.~~
		5.33.3.2. Assistant Chief Controller	5.33.3.2. Assistant Chief Controller
		5.33.3.2.1. Assistant Chief Controller reports to CC and provide assistance in all his activities.	5.33.3.2.1. Assistant Chief Controller reports to CC and provide assistance in all his activities.
		5.33.3.3. Fault management controller	5.33.3.3. Fault management controller
		5.33.3.3.1. This Controller will be front end trouble shooter for all signalling failures on line and responsible for communication with complete signalling staff on line for all failures. This controller will supervise the RBC, CBI, ATO & TMS subsystem.	5.33.3.3.1. This Controller will be front end trouble shooter for all signalling failures on line and responsible for communication with complete signalling staff on line for all failures. This controller will supervise the RBC, CBI, ATO & TMS subsystem.
		5.33.3.4. Power supply and traction Controller	5.33.3.4. Power supply and traction Controller
		5.33.3.4.1. TPC controls all equipment on line responsible for charging and discharging of Overhead and that control workstation shall be in scope of PST contractor. TMS workstation shall be provided for only monitoring of train along with OHE post locations.	5.33.3.4.1. TPC controls all equipment on line responsible for charging and discharging of Overhead and that control workstation shall be in scope of PST contractor. TMS workstation shall be provided for only monitoring of train. ~~along with OHE post locations.~~
		5.33.3.5. Traffic Controller	5.33.3.5. Traffic Controller
		5.33.3.5.1. Traffic Controller is responsible for Train movement, route dispatch assignment, on complete line. Traffic Controller system will have all functions available on MMI with these below mentioned major functions: -	5.33.3.5.1. Traffic Controller is responsible for Train movement, route dispatch assignment, on complete line. Traffic Controller system will have all functions available on MMI with these below mentioned major functions: -

		(1) Train Describer (Current Train Position), input of rake id (2) Train Graph; (3) Train Route Selection; (4) Station Symbolic Panel; (5) Dynamic planning of timetable (online timetable) (6) Timetable loading application 5.33.3.6. Rolling stock Controller 5.33.3.6.1. The rolling stock controller post shall be available in OCC/BCC. Responsible for managing all queries and faults related to rolling stock. 5.33.3.6.2. Signalling contractor shall supply the rolling stock controller console for rolling stock application GUI (Integrated TIMS) along with signalling workstation. But its software application shall be in scope of rolling stock contractor. 5.33.3.6.3. The different posts within the Control Room shall be placed in a way to facilitate, from an ergonomic point of view, the communications between the operators. Locations shall be decided on design stage later. 5.33.3.6.4. Signalling Contractor shall do Ergonomic survey of OCC for the placement of different workstations.	(1) Train Describer (Current Train Position), input of rake id (2) Train Graph; (3) Train Route Selection; (4) Station Symbolic Panel; (5) Dynamic planning of timetable (online timetable) (6) Timetable loading application 5.33.3.6. Rolling stock Controller 5.33.3.6.1. The rolling stock controller post shall be available in OCC/BCC. Responsible for managing all queries and faults related to rolling stock. 5.33.3.6.2. Signalling contractor shall supply the rolling stock controller console for rolling stock application GUI (Integrated TIMS) **which would be separate from TMS workstation for Rolling Stock.** ~~along with signalling workstation. But its s~~ **S**oftware application **for this console** shall be in scope of rolling stock contractor. **TMS workstation provided to Rolling Stock Controller with TMS display and rolling stock management function mentioned in para 5.19.18.** 5.33.3.6.3. The different posts within the Control Room shall be placed in a way to facilitate, from an ergonomic point of view, the communications between the operators. Locations shall be decided on design stage later.

		5.33.3.6.5. Contractor shall arrange furniture for OCC, BCC, Visitors' Gallery, crisis room and waiting area in OCC & BCC. 5.33.3.7. Central Equipment Room Following systems shall be installed in CER but not limited to:- 5.33.3.7.1. TMS & CTMS server shall be placed in special rooms, outside the Operation Control Room, may be called CER and allowing the exchange of information with Line Equipment and with other signalling and telecom systems. 5.33.3.7.2. NMS Server, Diagnostic and maintenance system and offline timetable shall be placed in this room. 5.33.3.7.3. Axle counter workstation, Playback workstation shall be installed in CER. 5.33.3.7.4. Furniture, Personal computer for report generation and workstations for CER shall be provided by Signalling contractor with prior approval from Employer's engineer. 5.33.3.8. Crisis/Emergency Room 5.33.4. This room shall be adjacent/near to the OCC/BCC whose design will be provided at later stage. In crisis room, S&T contractor shall provide, 2 high resolution projector system with display TV whose size shall not be less than 100 inches, and shall be capable of displaying Operational Overview of the entire corridor and may be used as per requirement of CCTV images. These	5.33.3.6.4. Signalling Contractor shall do Ergonomic survey of OCC for the placement of different workstations. 5.33.3.6.5. Contractor shall arrange furniture for OCC, BCC, Visitors' Gallery, crisis room and waiting area in OCC & BCC. 5.33.3.7. Central Equipment Room Following systems shall be installed in CER but not limited to:- 5.33.3.7.1. TMS ~~& CTMS~~ server shall be placed in special rooms, outside the Operation Control Room, may be called CER and allowing the exchange of information with Line Equipment and with other signalling and telecom systems. 5.33.3.7.2. NMS Server, Diagnostic and maintenance system and offline timetable shall be placed in this room. 5.33.3.7.3. Axle counter workstation **(refer clause No. 5.3.7 of PS)**, Playback workstation shall be installed in CER. 5.33.3.7.4. Furniture, Personal computer for report generation and workstations for CER shall be provided by Signalling contractor with prior approval from Employer's engineer. 5.33.3.8. **Not used** ~~Crisis/Emergency Room~~ **5.33.4. Crisis/Emergency Room** ~~5.33.4~~.**5.33.4.1.1**. This room shall be adjacent/near to the OCC/BCC whose design will be provided at later stage. In

		projector systems shall be of latest technology available at that time Contractor will take prior approval for these projector systems with accessories before procurement and installation. 5.33.4.1. The Crisis room shall also be equipped with Display system of train CCTV. 5.33.4.2. The display and size of the projecting view shall be ergonomically adjusted according to the room size with the prior approval of employer. 5.33.5. Organizational Model at BCC (Backup Control Centre) 5.33.5.1. BCC will be at Duhai Depot. BCC will be first operational before OCC and it shall act as an OCC till the commissioning of OCC at Jangpura. All installations at BCC and Back up CER shall be in scope of signalling contractor like the main OCC. Back up OCC shall remain intact after commissioning of OCC and it will act as a backup for OCC. 5.33.5.2. In the BCC the operators will be located in specific rooms as they are placed in OCC. Design will be finalised later.	crisis room, S&T contractor shall provide **one workstation for TMS operational overview and one Train view CCTV workstation. S&T Contractor shall also provide** 2 high resolution projector system with display TV whose size shall not be less than 100 inches, and shall be capable of displaying Operational Overview of the entire corridor and may be used as per requirement of **Train** CCTV images. These projector systems shall be of latest technology available at that time Contractor will take prior approval for these projector systems with accessories before procurement and installation. ~~5.33.4.1.~~ **5.33.4.2**. **Not used.** ~~The Crisis room shall also be equipped with Display system of train CCTV.~~ ~~5.33.4.2.~~ **5.33.4.3**. The display and size of the projecting view shall be ergonomically adjusted according to the room size with the prior approval of employer. 5.33.5. Organizational Model at BCC (Backup Control Centre) 5.33.5.1. BCC will be at Duhai Depot. BCC will be first operational before OCC and it shall act as an OCC till the commissioning of OCC at Jangpura. All installations at BCC and Back up CER shall be in scope of signalling contractor like the main OCC. Back up OCC shall remain intact after commissioning of OCC and it will act as a backup for OCC. **BCC will remain in cold Standby.** 5.33.5.2. In the BCC the operators will be located in specific rooms as they are placed in OCC. Design will be finalised later.

152	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.34.1.9.	All the functions of CTMS and TMS are fully integrated and executed in a real time environment in order to permit a prompt reaction of the operator. Quick reaction is obtained by the real time updated MMI and it shall be designed to reduce the operator actions. The MMI shall provide drag and drop, pan and zoom facilities that speed up several functionalities of the system	All the functions of ~~CTMS and~~ TMS are fully integrated and executed in a real time environment in order to permit a prompt reaction of the operator. Quick reaction is obtained by the real time updated MMI and it shall be designed to reduce the operator actions. The MMI shall provide drag and drop, pan and zoom facilities that speed up several functionalities of the system
153	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.34.4.3.	Line Overview Diagram - Permanent Display The line overview diagram shall permanently display, as a minimum, on all magnification levels, the following: 1. All tracks and turnouts; 2. Block boundaries; 3. IXL Boundary 4. Stations, station names, platforms and platform identities; 5. All points 6. Signals, Virtual Signals 7. Neutral zones; 8. Tunnels; and 9. Bridges. 10. ESP 11. OHE mast	Line Overview Diagram - Permanent Display The line overview diagram shall permanently display, as a minimum, on all magnification levels, the following: 1. All tracks and turnouts; 2. Block boundaries; 3. IXL Boundary 4. Stations, station names, platforms and platform identities; 5. All points 6. Signals, Virtual Signals 7. Neutral zones; 8. Tunnels; and 9. Bridges. 10. ESP 11. **Not used** ~~OHE mast~~

		12. Tunnel Ventilation Zone	12. Tunnel Ventilation Zone
154	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.34.4.4.	Line Overview Diagram - Detailed Display The magnification feature shall not only magnify the line overview, it shall add additional information and details at a higher magnifications levels as follows: 1. Point identities; 2. Block identities; 3. Signal identities; and 4. Maintenance blocks and temporary speed restriction zones. 5. OHE mast number and location Identities 6. Axle counter Identity 7. RBC There shall be the option on line overview diagram to hide any of these identity for ease of operation.	Line Overview Diagram - Detailed Display The magnification feature shall not only magnify the line overview, it shall add additional information and details at a higher magnifications levels as follows: 1. Point identities; 2. Block identities; 3. Signal identities; and 4. Maintenance blocks and temporary speed restriction zones. 5. **Not used** ~~OHE mast number and location Identities~~ 6. Axle counter Identity 7. RBC **(Static location)** There shall be the option on line overview diagram to hide any of these identity for ease of operation.
155	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.34.4.5	Line Overview Diagram - Dynamic Indications The line overview diagram shall display, on all magnification level at least the following dynamic indications: 34.Status of OHE Supply/OHE Energisation Status	Line Overview Diagram - Dynamic Indications The line overview diagram shall display, on all magnification level at least the following dynamic indications: 34.**Not used**. ~~Status of OHE Supply/OHE Energisation Status~~

156	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.35.3	In addition, following alarms shall be displayed on the Operational overview screens: 1.Trouble (Station equipment failure – CBI and ATP); 2.Power failure (No power supply to SER equipment's); 3.UPS failure (for UPS1 & UPS2); 4.Train Ready; 5.Train door status; 6.Blocking/ unblocking of points, route,signals and maintenance blocks; 7.Cycles in the terminal stations and intermediate turn back station; 8.OHE Trip Status	In addition, following alarms shall be displayed on the Operational overview screens: 1.Trouble (Station equipment failure – CBI and ATP); 2.Power failure (No power supply to SER equipment's); 3.UPS failure (for UPS1 & UPS2); 4.Train Ready; 5.Train door status; 6.Blocking/ unblocking of points, route, signals and maintenance blocks; 7.Cycles in the terminal stations and intermediate turn back station; 8.**Not Used.** ~~OHE Trip Status~~
157	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.37	5.37 CTMS and TMS Architecture 5.37.2 Communication redundancy meaning at least two physically distinct communication media shall be available between sender and receiver throughout the entire communication path, no matter how many intermediate nodes the message must go through. There shall be dual redundant communication medium between any two-computer units of OCC, between the CTMS/TMS/Local TMS/ Depot TMS servers, between the TMS/ Local TMS/	~~**CTMS and**~~ TMS Architecture 5.37.2 Communication redundancy meaning at least two physically distinct communication media shall be available between sender and receiver throughout the entire communication path, no matter how many intermediate nodes the message must go through. There shall be dual redundant communication medium between any two-computer units of OCC, between the ~~CTMS~~/TMS/Local TMS/ Depot TMS servers, between the TMS/ Local TMS/

		Depot TMS servers and the operator & maintenance workstations.	Depot TMS servers and the operator & maintenance workstations.
158	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 5, Clause No. 5.39.2.6.	The full scope of recorded Onboard ATP, RBC and ATO events shall be approved by the Engineer. The events recording shall take place at all times in any part of the track except when in stand- by/sleep mode and shall include the following functions at a minimum: 1. Speed direction 2. Time 3. Location 4. Mode of operation 5. Propulsion and brake demands 6. Movement authorities 7. Door enable 8. Over speeds 9. Emergency brake demands 10. Driving control panels commands 11. Train ATC bypass if applicable 12. ATC resets (onboard or trackside)	The full scope of recorded Onboard ATP, RBC and ATO events shall be approved by the **Engineer during design stage**. The events recording shall take place at all times in any part of the track except when in stand- by/sleep mode and shall include the following functions at a minimum **but not limited to**: 1. Speed direction 2. Time 3. Location 4. Mode of operation 5. Propulsion and brake demands 6. Movement authorities 7. Door enable 8. Over speeds 9. Emergency brake demands 10. Driving control panels commands 11. Train ATC bypass if applicable 12. ATC resets (onboard or trackside)

159	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix C	The existing Appendix C: List of TMS Workstations has been Revised. The revised **Appendix C: List of TMS Workstations R1** is attached herewith as **Attachment no. 04** in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.	
160	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Appendix D – Design Criteria/Clause 9.	The existing Clause No. 9 of Appendix D has been Revised. The revised **Clause No. 9** is attached herewith as **Attachment no. 05** in Addendum and Corrigendum No. 02B. Bidders may kindly note the same.	
161	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, APPENDIX F: LIST OF INDICATIONS, Clause No. 11.	11. Route commands (1) route set/release/block (2) Overlap (3) Approach Lock 12. 11. cycle indication 13. PSD status indication 14. OHE mast number along the Track 15. Indication of Train Hold, SS, KDC, Train ready 16. Indication for any ATP/IXL/ATO failure. 17. Level of Control of Operation 18. Hot axle box detector indication 19. Power supply, UPS and Traction supply failure.	11. Route commands (1) route set/release/block (2) Overlap (3) Approach Lock ~~12. 11~~. **(4)** cycle indication ~~13.~~ **(5)** PSD status indication ~~14.~~ **(6**) **Not used.** ~~OHE mast number along the Track~~ ~~15.~~ **(7)** Indication of Train Hold, SS **(Skip Station)**, ~~KDC,~~ Train ready ~~16.~~ **(8)** Indication for any ATP/IXL/ATO failure. ~~17.~~ **(9)** Level of Control of Operation ~~18.~~ **(10)** Hot axle box detector indication ~~19.~~ **(11)** Power supply, UPS and Traction supply failure.

162	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 1/ CLAUSE NO. 1.3.5		**[Add the following new Sub Clause No. 1.3.5.2 in Clause No. 1.3.5 in PS]** **The contractor shall ensure compliance to either the standards mentioned in this PS or their equivalent Indian standards, as appropriate.**
163	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 1/ CLAUSE NO. 1.4.8.1	The Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm respectively at three (03) suitable places for constructing temporary storage facilities for Contractor. The Contractor will construct the storage facility within 4 months of possession of land given by NCRTC. The space will be available to the Contractor till end of Defect Liability Period.	~~The Telecom Contractor will be provided a space of about 1200 sqm and 600 Sqm respectively at three (03) suitable places for constructing temporary storage facilities for Contractor. The Contractor will construct the storage facility within 4 months of possession of land given by NCRTC. The space will be available to the Contractor till end of Defect Liability Period.~~ **The Telecom Contractor will be provided a space for constructing temporary storage facilities/project office. Please refer Appendix A of Section -6B: Particular Specifications Signalling and Train Control for details.**
164	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 2/ CLAUSE NO. 2.2.5 (2)	Wall mountable Station Announcement Equipment at each Platform/ PSBs (wherever applicable)	Wall mountable ~~Station Announcement Equipment~~ **PAS control panel** at each Platform/ PSBs (wherever applicable)
165	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.4.2.8 (3), 2.4.4.1, 2.4.4.2, 2.6.2.3 (1), 2.6.3.12 (8)**	**2.4.2.8 (3)** Frequency Response: All areas 100 Hz to 16 khz at - 10 dB and In case of horn speaker 500 Hz to 4.5 khz at - 10dB. **2.4.4.1.** The minimum overall system frequency response for the PAS from 100 Hz to 16 kHz at -10 dB and in case of horn speaker 500 Hz – 4.5 kHz at -10 dB excluding PA from depots.	**2.4.2.8 (3)** Frequency Response: All areas ~~100 Hz to 16 khz~~ **340 Hz to 14 khz or better** at - 10 dB and in case of horn speaker 500 Hz to 4.5KHz at - 10dB. **2.4.4.1.** The minimum overall system frequency response for the PAS from ~~100 Hz to 16 khz~~ **340 Hz to 14 khz or better** at -10 dB and in case of horn speaker 500 Hz to 4.5 KHz at -10 dB excluding PA from depots.

		2.4.4.2 The corresponding system frequency response from a radio input channel shall be 100 Hz to 16 kHz, ± 3 dB or better. **2.6.2.3 (1)** The minimum overall system frequency response for the PAS from 100 Hz to 16 khz at -10dB and In case of horn speaker 500Hz - 4.5khz at -10dB. **2.6.3.12 (8)** Loudspeakers shall have a minimum frequency response from 100 Hz to 16 kHz at -10 dB and in case of horn speaker 500 Hz – 4.5 kHz at -10 dB.	**2.4.4.2** The corresponding system frequency response from a radio input channel shall be ~~100 Hz to 16 kHz, ± 3 dB or better~~ **as per interface requirement.** **2.6.2.3 (1)** The minimum overall system frequency response for the PAS from ~~100 Hz to 16~~ **340 Hz to 14 khz or better** at -10dB and In case of horn speaker 500Hz - 4.5KHz at -10dB. **2.6.3.12 (8)** Loudspeakers shall have a minimum frequency response from ~~100 Hz to 16~~ **340 Hz to 14 khz or better** at -10 dB and in case of horn speaker 500 Hz – 4.5 kHz at -10 dB.
166	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.1.4**	PAS announcement shall be capable of being originated from designated radio sets also to a set of pre-defined PAS zones at each station. It should be possible to make simultaneously Radio to PAS announcement at minimum 5 different stations. This needs to be coordinated, planned, executed and demonstrated by the contractor along with the Radio and Telephone contractor.	PAS announcement shall be capable of being originated from designated radio **and telephone** sets also to a set of pre-defined PAS zones at each station. It should be possible to make ~~simultaneously~~ Radio to PAS **and telephone to PAS** announcements **simultaneously** at minimum 5 different stations. ~~This~~ **Both these facilities** need~~s~~ to be coordinated, planned, executed and demonstrated by the contractor ~~along with the Radio and Telephone contractor~~.
167	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.9.5**	Live audio broadcast relating to emergency, fire and evacuation messages from OCC/ BCC shall be recorded in the Centralized Voice Recording system at OCC/ BCC. Similar broadcasts made from SCR / PCBs shall be recorded at the SCR / TER in the PAS station server or the MMI itself. It shall however be possible to retrieve any	Live audio broadcast relating to emergency, fire and evacuation messages from OCC/ BCC shall be recorded in the Centralized Voice Recording system at OCC/ BCC. Similar broadcasts made from SCR ~~/ PCBs~~ shall be recorded at the SCR / TER in the PAS station server or the MMI itself. It shall however be possible to retrieve any

		message so recorded and save the same on an external storage device like a memory stick for future reference.	message so recorded and save the same on an external storage device like a memory stick for future reference. **All the recording must be stored for a minimum duration of 90 Days**.
168	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.10.2**	The PAS shall have the facility to broadcast live FM/AM (Govt. Channels/ Frequencies or any other channel).	~~The PAS shall have the facility to broadcast live FM/AM (Govt. Channels/ Frequencies or any other channel).~~ **Not used**
169	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.13.1 (2)**	MMI for PAS and PIDS shall be integrated/ implemented on a common Terminal/Workstation. MMI at Station Control Room should be an industrial grade workstation kept in TER/CER and all signals extended to SCR/ OCC/ BCC Theatre (Monitor, Mouse, Keyboard etc.)	MMI for PAS and PIDS shall be integrated/ implemented on a common Terminal/Workstation. MMI at Station Control Room should be ~~an industrial grade workstation~~ kept in TER/CER and all signals extended to SCR/ OCC/ BCC Theatre (Monitor, Mouse, Keyboard etc.)
170	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.15.1 (1)**	**The PAS / PIDS NMS shall monitor system alarm status on real time basis; alarm data shall also be stored for future inquiries. It is envisaged that one NMS and a corresponding workstation shall be provided. The NMS at OCC & BCC shall have jurisdiction over all corridors and shall extend a workstation to OCC/BCC. The NMS should not be available for access in other than CSS / CER. The PAS and PIDS NMS shall be on the same server / workstation. However, no monitoring or control of depot PAS system is required as it is a standalone system.**	The PAS / PIDS NMS shall monitor system alarm status on real time basis; alarm data shall also be stored for future inquiries. It is envisaged that one NMS and a corresponding workstation shall be provided. The NMS at OCC & BCC shall have jurisdiction over all corridors and shall extend a workstation to OCC/BCC. ~~The NMS should not be available for access in other than CSS / CER~~. The PAS and PIDS NMS shall be on the same server / workstation. However, no monitoring or control of depot PAS system is required as it is a standalone system.
171	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.5.15.2 (1-xiv)**	**Failure of hard wired MMI for Platform**	**Failure of hard wired ~~MMI for Platform~~ PAS Control Panel at any location and failure of PIDS- PAS- MMI at any location.**

172	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.6.3.12 (6)**	**Horn loudspeakers should not be supplied except in plant rooms**	**~~Horn loudspeakers should not be supplied except in plant rooms~~ Horn loudspeakers may be supplied only for plant rooms or outdoor/ open locations of depot.**
173	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 2/ CLAUSE NO. 2.8.10.1**	**An interface with the security alarm system will be provided. This interface will be used for making security announcements in case of security or safety-based events. This interface should either be IP level or hard wired. In event of hard-wired interface, the interface box shall be placed in the TER. Wiring to the PAS server beyond the interface box shall be responsibility of PAS (Telecom) Contractor.**	**If applicable, an interface with the security alarm system will be provided by the telecom contractor. This interface will be used for making security announcements in case of security or safety-based events. This interface should either be IP level or hard wired. In event of hard-wired interface, the interface box shall be placed in the TER. Wiring to the PAS server beyond the interface box shall be responsibility of PAS (Telecom) Contractor.**
174	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 3/ CLAUSE NO. 3.5.1.1 (1- i)**	Integrated PIDS/PAS central server shall be located in the OCC & BCC CER which shall be connected to the integrated PIDS/ PAS station server equipment at each station TER via the data transmission system. The PIDS/PAS central server shall have redundant architecture and connectivity to workstation MMIs with mirroring of disks for high reliability.	**Integrated PIDS/PAS central server shall be located in the OCC & BCC CER which shall be connected to the integrated PIDS/ PAS station server equipment at each station TER via the data transmission system. The PIDS/PAS central server shall have redundant architecture (main server at OCC and standby server at BCC) ~~and connectivity to workstation MMIs~~ with mirroring of disks for high reliability and connectivity to workstation MMIs.**
175	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 3/ CLAUSE NO. 3.5.1.1 (4-i-a&b), 3.5.1.1 (5-i-c),**		a. Display Line 1: Train information like destination information, arrival & departure time, train length, train occupancy details etc (in both Hindi and English as per requirement). Information pertaining to current date, time, ~~temperature and air quality index~~ shall also be displayed. b. Display Line 2: Train information like destination information, arrival & departure time, train length, train occupancy details etc (in both Hindi and English as per requirement) or Scrolling/ flipping train data for the next 2-3 trains or any advertisement related message or any public information. Information pertaining to current date, time, ~~temperature and air quality index~~ shall also be

			displayed. c. Information pertaining to current date, time, ~~temperature and air quality index~~ shall also be displayed.
176	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 3/ CLAUSE NO. 3.5.1.1 (8- xii)**	Asset Management feature	~~Asset Management feature~~ 1. **Not Used**
177	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 4/ CLAUSE NO. 4.5.1.5 (6)**	The Sub-Master Clock system shall provide appropriate clock output interfaces for master clock and timing and reference distribution. The type and quantities of the clock output interfaces shall be determined by the interfaces requirements of the subsystems (PAS, PIDS, Radio, CCTV, CDRS, Telephone System etc) and relevant interfacing project contractors (Traction, Fare Collection, Train Control and Signalling etc.). Suitable interfaces (such as RS 422 or RS232 or LAN connections) for clock output interfaces shall be supported.	The Sub-Master Clock system shall provide appropriate clock ~~output~~ interfaces for master clock and timing and reference distribution. The type and quantities of the clock output interfaces shall be determined by the interfaces requirements of the subsystems (PAS, PIDS, Radio, CCTV, CDRS, Telephone System etc) and relevant interfacing project contractors (Traction, Fare Collection, Train Control and Signalling etc.). Suitable interfaces (such as RS 422 or RS232 or LAN connections) for clock output interfaces shall be supported.
178	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.2.3 (4)**	Locations outside the stations: RSS (Receiving substation) SCADA Room, Control Rooms, Entrances, Exits, Parking areas, RSS boundary (Perimeter), Ancillary buildings, Pump Room, DG Set/ room, Mid shafts (tunnel shafts, escape routes on the viaduct, other exit points on the viaduct), station's subway, specially identified theft prone areas should be covered by CCTV.	Locations outside the stations: RSS (Receiving substation) SCADA Room, Control Rooms, Entrances, Exits, Parking areas, RSS boundary (Perimeter), Ancillary buildings, Pump Room, DG Set/ room, **cross passages in tunnels**, Mid shafts (tunnel shafts, escape routes on the viaduct, other exit points on the viaduct), station's subway, specially identified theft prone areas should be covered by CCTV.
179	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/	The CCTV system shall have control equipment located in the TER at all stations, Depot, OCC & BCC. CCTV control equipment for RSSs /Mid shafts/ ramp/ viaduct escape	The CCTV system shall have control equipment located in the TER at all stations, Depot, OCC & BCC. CCTV control equipment for RSSs /Mid shafts/ ramp/ viaduct escape

	CH- 5/ CLAUSE NO. 5.5.1.9	routes, SPC etc. shall be installed in the TER of adjacent station / depot.	routes, SPC etc. shall be installed in the TER of adjacent station / depot. **Note: Tentative counts: MTS- 2, RSS- 5**
180	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.4.1.2**	The OEM for CCTV system shall be registered in India with self-owned service centre for more than 10 years without joint venture.	**Not used** ~~The OEM for CCTV system shall be registered in India with self-owned service centre for more than 10 years without joint venture.~~
181	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.4.1.3**	The OEM shall have implemented end to end CCTV solution in minimum 3 Indian metro environment.	**Not used.** ~~The OEM shall have implemented end to end CCTV solution in minimum 3 Indian metro environment.~~
182	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.1.1 (14)**	Camera, Housing and software should be from same OEM.	**Not used** ~~Camera, Housing and software should be from same OEM.~~
183	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.5.5.1**	Video recording system shall provide primary recording locally at the respective station and mirrored recorded at adjacent station for all stations. The Network Video Recording system shall provide Fail over and Redundancy.	Video recording system shall provide primary recording locally at the respective station and mirrored recorded at adjacent station for all stations. ~~The Network Video Recording system shall provide Fail over and Redundancy~~.
184	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.1**		**[Add the following new Sub Clause No. 5.6.1.2 in Clause No. 5.6.1 in PS]** **5.6.1.2 CCTV Monitoring** **Detection is the main function of the CCTV system. Following principles of image proportion shall be complied to:**

			I. Target image has to be at least 20% of the full screen height. **ii. To detect an intruder, the target image must be at least 10% of the screen height.** **iii. To recognize, the image has to be 50% of the screen height.** **iv. To identify, the image need to be 100% of the screen height.**
185	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.2 (7)**	All CCTV cameras shall be self-diagnosis, auto focus feature and SD card storage facility.	All CCTV cameras shall be self-diagnosis, auto focus feature and SD card storage **slot** facility.
186	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.19 (1-iv)**	The video management system shall allow a minimum 1,00,000 number of cameras, recording servers and clients to be connected to management server across multiple sites.	The video management system shall allow a minimum ~~1,00,000~~ **25000** number of cameras, recording servers and clients to be connected to management server across multiple sites.
187	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.19 (3-x)**	**System should ensure that once recorded, the video cannot be altered, ensuring the audit trail is intact for evidential purposes. This has to be achieved using Authentication with SHA-256 hashing function, combined with 1024-bit RSA public-private key pair. Water marking alone for ensuring temper proof recording is not sufficient**	System should ensure that once recorded, the video cannot be altered, ensuring the audit trail is intact for evidential purposes. This has to be achieved using Authentication with ~~SHA-256~~ **SHA- 1 or better** hashing function, combined with 1024-bit RSA public-private key pair. Water marking alone for ensuring temper proof recording is not sufficient
188	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.6 (23)**	**Alarm: 1 IN/ 1 OUT**	~~Alarm: 1 IN/ 1 OUT~~ **Not used**

189	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.6 (24)**	Security: 1. Three-level password protection, IP Address filtering, User Access Log, HTTPS encryption 2. 802.1x network authentication with EAP/TLS 3. On board trusted platform module (TPM), Public key infrastructure (PKI) Support 4. AES 256 Encryption 5. Signed Firmware **6. IP addresses which have never been successfully logged in and had more than 3 failed log-in attempts during the last 20 seconds are blocked.**	~~Security:~~ ~~1. Three-level password protection, IP Address filtering, User Access Log, HTTPS encryption~~ ~~2. 802.1x network authentication with EAP/TLS~~ ~~3. On board trusted platform module (TPM), Public key infrastructure (PKI) Support~~ ~~4. AES 256 Encryption~~ ~~5. Signed Firmware~~ ~~6. IP addresses which have never been successfully logged in and had more than 3 failed log-in attempts during the last 20 seconds are blocked.~~ **Not Used**
190	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.6 (25)**	SD CARD Support: Built in SD card slot with support up to 2 TB with Class 10 speed	SD CARD Support: Built in SD card slot with **minimum** support ~~up to 2 TB~~ **of 256 GB** with Class 10 speed
191	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.7 (24)**	Alarm: 1 IN/ 1 OUT.	~~Alarm: 1 IN/ 1 OUT~~ **Not Used**
192	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 5/ CLAUSE NO. 5.6.2.7 (25)**	Security: 1. Three-level password protection, IP Address filtering, User Access Log, HTTPS encryption 2. 802.1x network authentication with EAP/TLS 3. On board trusted platform module (TPM), Public key infrastructure (PKI) Support 4. AES 256 Encryption 5. Signed Firmware	~~Security:~~ ~~1. Three-level password protection, IP Address filtering, User Access Log, HTTPS encryption~~ ~~2. 802.1x network authentication with EAP/TLS~~ ~~3. On board trusted platform module (TPM), Public key infrastructure (PKI) Support~~ ~~4. AES 256 Encryption~~ ~~5. Signed Firmware~~

<table>
<tr><td></td><td></td><td>6. IP addresses which have never been successfully logged in and had more than 3 failed log-in attempts during the last 20 seconds are blocked.</td><td><s>6. IP addresses which have never been successfully logged in and had more than 3 failed log-in attempts during the last 20 seconds are blocked.</s>
Not Used</td></tr>
<tr><td>193</td><td>PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 5/ CLAUSE NO. 5.6.2.7 (26)</td><td>SD CARD Support: Built in SD card slot with support up to 2 TB with Class 10 speed</td><td>SD CARD Support: Built in SD card slot with <u>minimum</u> support <s>up to 2 TB</s> <u>of 256 GB</u> with Class 10 speed</td></tr>
<tr><td>194</td><td>PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 5/ CLAUSE NO. 5.6.2.11 (2-1)</td><td>The Switch shall be high performance, manageable and shall have minimum 28x10/100Mbps ports including 2x1Gigabit Fibre Uplink ports.</td><td>The Switch shall be high performance, manageable and shall have minimum <s>28</s> <u>24</u>x10/100<u>/1000</u> Mbps ports including 2x1Gigabit Fibre Uplink ports.</td></tr>
<tr><td>195</td><td>PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 5/ CLAUSE NO. 5.6.2.19 (3-xvi)</td><td>Minimum recording shall be for 15 days.</td><td>Minimum recording shall be for <s>15</s> <u>90</u> days.</td></tr>
<tr><td>196</td><td>PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 5</td><td></td><td>[Add the attached Annexure T-A1 new Sub Clause No. 5.9 in PS]</td></tr>
<tr><td>197</td><td>PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ CH- 6/ CLAUSE NO. 6.5.1.1.2 (9)</td><td>
<table>
<tr><th>Item No</th><th>Description of Item</th><th>Station</th><th>OCC/BCC/HQ/Depot</th></tr>
<tr><td>1.</td><td>Equipped Ports</td><td>48</td><td>512</td></tr>
<tr><td>2.</td><td>Wired Ports including the License therein</td><td>96</td><td>1024</td></tr>
<tr><td>3.</td><td>Basic Telephones</td><td>20</td><td>1570</td></tr>
<tr><td>4.</td><td>Digital Phones</td><td>5</td><td>70</td></tr>
</table>
</td><td>
<table>
<tr><th>Item No</th><th>Description of Item</th><th><u>Per</u> station</th><th><u>Per Location</u> (OCC/BCC/HQ/Depot)</th></tr>
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<tr><td>3.</td><td>Basic Telephones</td><td>20</td><td>1570</td></tr>
</table>
</td></tr>
</table>

		5.	CLIP	Yes Required	Yes Required			**(total for OCC, BCC, Depots, HQ)**
		6.	Management PC + Printer (Common for IP PBX & Direct Line System)	-	As required	4.	Digital Phones	5	70 **(total for OCC, BCC, Depots, HQ)**
		7.	MDF including protection devices No. of pairs	100	512	5.	CLIP	Yes Required	Yes Required
		8.	Ports for connectivity of CO Lines/PRI lines/PRI Lines from PSTN (BSNL/MTNL/Other)	-	04 PRI LINK & 36 CO Lines.	6.	Management PC + Printer (Common for IP PBX & Direct Line System)	-	As required
		9.	PFCT (For CO Lines)	-	6	7.	MDF including protection devices No. of pairs	100	512
		10.	DCR (Detail Call Records)	Yes Required	Yes Required	8.	Ports for connectivity of CO Lines/PRI lines/PRI Lines from PSTN (BSNL/MTNL/Other)	-	04 PRI LINK & 36 CO Lines.
		11.	ETHERNET Ports	As Required	As Required	9.	PFCT (For CO Lines)	-	~~6~~ **4**
						10.	DCR (Detail Call Records)	Yes Required	Yes Required

			11. ETHERNET Ports — As Required — As Required
198	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.2.4.2**		**[Add the following new Sub Clause No. 7 & 8 in Clause No. 6.5.2.4.2 in PS]** **7. The emergency phone must be facilitated with a flasher and a hooter.** **8. This phone shall be IP- 66 rated or better.**
199	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.2.5**		**[Add the following new Sub Clause No. 5 in Clause No. 6.5.2.5 in PS]** **5. The Help points shall be IP- 66 rated.**
200	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.3.1.4 (8)**	IP PBX Phones (Voice): Station- 2 OCC/ BCC/ HQ- 10 Depot- 10	IP PBX Phones (Voice): **(In Fin. Bid./ Annex.- 2/ Schedule 6/ Refer to S. No. 11 i.e. Voice IP Phone)** Station- 2 **(per station)** OCC/ BCC/ HQ- ~~10~~ **180 (total)** Depot- 5 **(per depot)**
201	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.3.1.4 (11)**	Total Number of user (Voice Phones): OCC/ BCC/ HQ: 72	~~Total Number of user (Voice Phones):~~ ~~OCC/ BCC/ HQ: 72~~ **Not Used**
202	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.3.1.25 (2)**	L3 Stackable Managed Switch 24 Ethernet 10/100/1000 RJ-45, 2 10G SFP+ for Uplink, 4 combo 10GBase-T CX-4 ports, Redundancy at all levels including power supplies,	L3 Stackable Managed Switch 24 Ethernet 10/100/1000 RJ-45, 2 10G SFP+ for Uplink, ~~4 combo 10GBase-T CX-4 ports~~, Redundancy at all levels including power supplies,

		software and hot-swappable Small Form Factor Pluggable (SFP) modules. One SFP port should be populated in switch to carry data upto 100 kms minimum. IPv6 compliant. Routing protocols such as OSPF, Border Gateway Protocol, Multicasting protocol, Flood control, 4K VLANS. Provision for local/remote configuration backups.	software and hot-swappable Small Form Factor Pluggable (SFP) modules. One SFP port should be populated in switch to carry data upto 100 kms minimum. IPv6 compliant. Routing protocols such as OSPF, Border Gateway Protocol, Multicasting protocol, Flood control, 4K VLANS. Provision for local/remote configuration backups.
203	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 6/ CLAUSE NO. 6.5.4.6.11.1**	IP PBX Telephones *The IP PBX telephones (Audio & Video) shall be equipped with, but not be limited to, the following facilities:*	IP PBX Telephones **(Voice IP Phones)** *The IP PBX telephones ~~(Audio & Video)~~ shall be equipped with, but not be limited to, the following facilities:*
204	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 7/ CLAUSE NO. 7.7.1.1 (1)**	Core data switch (Redundant Switches installed at OCC/BCC) consisting of Primary Management module and Redundant Management module functioning in Active Passive mode.	Core data switch (Redundant Switches installed at OCC/BCC) consisting of Primary Management module and Redundant Management module functioning in Active ~~Passive~~ **Active** mode.
205	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 7/ CLAUSE NO. 7.5.2.2**	The DTS network shall be SDN ready and incorporate a central monitoring system to gather operational data for performance checking, historical trend analysis, and maintenance. This monitoring system shall provide facilities to handle filing, storage, display, and printing of historical records.	**The DTS network shall be SDN ready or equivalent and incorporate a central monitoring system to gather operational data for performance checking, historical trend analysis, and maintenance. This monitoring system shall provide facilities to handle filing, storage, display, and printing of historical records.**
206	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.2.9.4**	**Sensor Controller** 1) It shall be able to display all the operational status and send the alarm signals to the ACS Local server. It shall also be able to detect sensor failure and the damage of connecting wires.	**Sensor Controller** **1) It shall be able to display all the operational status and send the alarm signals to the ACS ~~Local~~ ~~server~~ MMI. It shall also be able to detect sensor failure ~~and the damage of connecting wires~~.**
207	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.3.2.1**	The scope of supply for each of the Station, Technical rooms, Depot, Maintenance Centre in OCC and OCC building shall include, but not be limited to the following items:	The scope of supply for each of the Station, Technical rooms, Depot, Maintenance Centre in OCC and ~~OCC~~ **BCC, HQ, MTS, RSS, Ramps, cross passages etc** shall include, but not be limited to the following items:

208	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.3.2.1 (5,11)**	5. IP controller 4/8 I/O for intrusion detection, with flashlight and hooter wherever required; 11.Special motion detectors	**5.Access Point Controller or** IP controller 4/8 I/O for intrusion detection, ~~with~~ flashlight and hooter wherever required; 11.Special motion detectors **(wherever required)**
209	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.3.2.1 (3)**	Central and Redundant ACS server at OCC & BCC	Central ~~and~~, Redundant ACS server at OCC & BCC **respectively with MMI**.
210	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.3.2.1 (7)**	PCU (Perimeter Controller Unit), ZPM (Zone Processor Module) for depot surveillance and detection;	PCU (Perimeter Controller Unit), ZPM (Zone Processor Module) for depot, **RSS, Ramps etc** surveillance and detection;
211	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.5.3.5 (1)**	**Motion detection cameras, which shall be provided as part of the intrusion detection system along with associated special software and software licenses;**	Motion detection cameras, which shall be provided as part of the ~~intrusion detection~~ **CCTV** system along with associated special software and software licenses;
212	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.5.3.6**	Intruder Detection facilities for portals and ramps shall not be triggered by the presence of trains and shall mainly identify the presence of personnel and animals, adopting one of the above types of detection, which is proven and implemented in other railway/metro networks.	Intruder Detection facilities for portals and ramps shall not be triggered by the presence of trains and shall mainly identify the presence of personnel and animals, adopting one of the above types of detection, which is proven and implemented in other railway/metro networks**/ airports**.
213	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.5.3.14**	On initiation of an alarm, CCTV cameras within the affected zone shall employ automatic positioning and shall continuously adjust pan, tilt and zoom to keep the intruder within the cameras field of view.	On initiation of an alarm, ~~CCTV cameras within the affected zone shall employ automatic positioning and shall continuously adjust pan, tilt and zoom to keep the intruder within the cameras field of view~~**. CCTV view of the affected zone shall come up on the MMI to keep the intruder within the cameras field of view.**
214	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.5**		**[Add the following new Sub Clause No. 8.5.9 in Clause No. 8.5 in PS]**

			Other facilities: i. Entry/ Exit point forced open ii. Held open iii. Alarm tempering iv. Anti- tailgaiting v. Unauthorized attempt to a secure zone vi. Duress vii. Power failure viii. Network failure ix. Attempt with expired card Deliberate sabotage.
215	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.6.1.1 (1)**	A central access control server (with hardware redundancy and disk mirroring) shall be installed in CER within the OCC & BCC, which shall control and monitor all of the access control and Intruder Detection facilities installed within all of the Delhi-Ghaziabad-Meerut RRTS sites. Central Access Control Server shall be able to integrate with Integrated Security Communication Server.	A central access control server (with hardware redundancy and disk mirroring) shall be installed in CER within the OCC & BCC, which shall control and monitor all of the access control and Intruder Detection facilities installed within all of the Delhi-Ghaziabad-Meerut RRTS sites. ~~Central Access Control Server shall be able to integrate with Integrated Security Communication Server.~~
216	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.6.1.2 (1-i)**	c. Visual Display **Keypad**	c. Visual Display **(preferably)** d. Keypad **(preferably)**
217	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.6.1.10 (1)**	The following areas shall have controlled access, via the Access Control System, viz; Stations, Ventilation Shafts, Electrical Sub stations, OCC, BCC, ramp areas and Depot complexes **1**	The following areas, **with prior approval from the employer's representative**, shall be equipped for controlled access, via the Access Control System, viz; Stations, Ventilation Shafts, Electrical Sub stations, OCC, BCC, ramp areas, **HQ** and Depot complexes **218**

219	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.6.1.3 (2-i), 8.7.1.5**	**8.6.1.3 (2-i)** Provision and installation of electro-mechanical locks (EML) on the doors to be provided with access control. **8.7.1.5** Electromechanical locks in doors, barriers and gates for access control functions;	**8.6.1.3 (2-i)** Provision and installation of electro-mechanical **or electro- magnetic** locks (EML) on the doors to be provided with access control. **8.7.1.5** Electromechanical **or electromagnetic** locks in doors, barriers and gates for access control functions;
220	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.6.1.5 (1,2)**	**Intruder Detection Facilities** 1) Intruder Detection facilities shall be installed (i) Around building entrances of unmanned sites including stations (round the clock for normally un-manned buildings and outside the normal working hours for sites manned for part of the day) (ii) Around the vehicular and pedestrian exits at the depots; (iii) Around the perimeter fence of the depot and electrical sub-stations; (iv) At the track entrances to portals, which provide the line side interchange between the surface and the sub-surface, route sections; (v) At the doors interconnecting cross-passageways in tunnel sections. (vi) Ventilation Shafts area. 2) The doors inter-linking the cross-passages of tunnels should be provided with access control system so that these can be opened by authorized maintenance Staff; these will also have access breach detection arrangements and sensors to detect the closed condition of doors as well as their remaining open continuously beyond the prescribed time-limit. (i) Intruder detection at the other locations shall include	~~**Intruder Detection Facilities**~~ ~~1) Intruder Detection facilities shall be installed~~ ~~(vii) Around building entrances of unmanned sites including stations (round the clock for normally un-manned buildings and outside the normal working hours for sites manned for part of the day)~~ ~~(viii) Around the vehicular and pedestrian exits at the depots;~~ ~~(ix) Around the perimeter fence of the depot and electrical sub-stations;~~ ~~(x) At the track entrances to portals, which provide the line side interchange between the surface and the sub-surface, route sections;~~ ~~(xi) At the doors interconnecting cross-passageways in tunnel sections.~~ ~~(xii) Ventilation Shafts area.~~ ~~2) The doors inter-linking the cross-passages of tunnels should be provided with access control system so that these can be opened by authorized maintenance Staff; these will also have access breach detection arrangements and sensors to detect the closed condition of doors as well as their remaining open continuously beyond the prescribed time-limit.~~ ~~(ix) Intruder detection at the other locations shall include~~

		one or more of the following techniques/methodologies: (ii) Motion detection cameras, which shall be provided as part of the Intrusion detection system along with associated special software and software licenses; (iii) Vibration detection; (iv) Fence-mounted sensors; (v) Infrared beam detectors; (vi) Microwave beam detectors; (vii) Door relay; (viii) Beam interruption, etc. **The Contractor shall propose, for each location, the most effective and technically feasible detection facility which is cost effective.**	~~one or more of the following techniques/methodologies:~~ ~~(x) Motion detection cameras, which shall be provided as part of the Intrusion detection system along with associated special software and software licenses;~~ ~~(xi) Vibration detection;~~ ~~(xii)Fence-mounted sensors;~~ ~~(xiii) Infrared beam detectors;~~ ~~(xiv) Microwave beam detectors;~~ ~~(xv) Door relay;~~ ~~(xvi) Beam interruption, etc.~~ ~~(xvii) The Contractor shall propose, for each location, the most effective and technically feasible detection facility which is cost effective.~~ **Not Used**
221	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 8/ CLAUSE NO. 8.7.1.2**	Integration of CCTV & ACIDS MMIs.	Integration of CCTV & ACIDS MMIs **for all stations, depots, etc for features like:** **i. At stations, depots, other controlling positions the MMIs for ACIDS (software/ GUI/ alarms etc) shall be integrated into CCTV- MMI. The Hardware of the CCTV MMI shall be used for ACIDS.** **Ii. display of CCTV view on ACIDS MMI at OCC & BCC as and when required,** **iii. Display of CCTV view of affected zone on initiation of alarm through ACIDS.**
222	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/	CVRS has to be provided a back-up at Depot or any other approved convenient location.	~~CVRS has to be provided a back-up at Depot or any other approved convenient location.~~ **Not Used**

	CH- 10/ CLAUSE NO. 9.3.2.1 (3)		
223	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 10/ CLAUSE NO. 9.4.2.2**	**As per the design requirements CVRS has to be provided a back-up at Depot or other approved location. Contractor shall provide MTBF values for the CVRS and submit calculations for the availability of the designed system.**	**~~As per the design requirements CVRS has to be provided a back-up at Depot or other approved location.~~ Contractor shall provide MTBF values for the CVRS and submit calculations for the availability of the designed system.**
224	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 11/ APPENDIX- B**	**The Existing Appendix B has been revised. The revised Appendix B-R2 is attached herewith in addendum no. 2. Bidders may kindly note the same.**	
225	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 11/ APPENDIX- F/ CLAUSE 1.2.6.1 (5)**	**The Large Screen Graphics Wall shall be installed in the Control Room at OCC & BCC. The Large screen Graphics Wall shall be made up of 10 Rear Projection Modules fitted in 5 columns wide and 2 rows high and the overall screen size shall be approximately 7750 (w) mm x 1744 (h) mm.**	**The Large Screen Graphics Wall shall be installed in the <u>Security</u> Control Room ~~at OCC & BCC~~ . The Large screen Graphics Wall shall be made up of 10 Rear Projection Modules fitted in 5 columns wide and 2 rows high and the overall screen size shall be approximately 7750 (w) mm x 1744 (h) mm.**
226	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 11/ APPENDIX- H/ CLAUSE 1.3**	1.3 STATIONS AREA (INDOOR EQUIPMENT) 1.3.1 Main Earth: 1.3.1.1 Main earth (< 2 Ohm) bus bar shall be provided in the TER, SCR & UPS (S&T) room by another Project/EMF Contractor with copper strip at each location consisting of minimum 20 holes (10 per row). This strip shall be used by Telecom Contractor, to extend their individual earths to their respective cables and all racks/equipment. 1.3.2 Clean Earth:	**i)** **1.3 STATIONS** AREA (INDOOR EQUIPMENT) **ii)** **1.3.1** Main Earth: **1.3.1.**1 Main earth (< ~~2~~ **<u>1</u>** Ohm) bus bar shall be provided in the TER~~, SCR & UPS (S&T) room by another Project/EMF Contractor~~ with copper strip at each location consisting of minimum 20 holes (10 per row). This strip shall be used by Telecom Contractor, to extend their individual earths to their respective cables and all racks/equipment. iii) 1.3.2 Clean Earth:

		1.3.2.1 Provision and extension of clean earth (< 1 ohm) up to TER to be done by telecom contractor. A minimum cross section of 25 mm2 insulated redundant copper wire shall be used for earthing. The earthing to be terminated in TER on copper strip with a copper bus bar having minimum 20 holes. This strip shall be used by Telecom Contractor, to extend their individual earths to their respective cables and racks/equipment.	**1.3.2.1 Clean earth (< 0.5 ohm)** ~~Provision and extension of clean earth (< 1 ohm)~~ **bus bar shall be provided with copper strip in the** ~~**up to**~~ TER **at each location** ~~to be done by telecom contractor~~. A minimum cross section of 25 mm2 insulated redundant copper wire shall be used for earthing. The earthing to be terminated in TER on copper strip with a copper bus bar having minimum 20 holes. This strip shall be used by Telecom Contractor, to extend their individual earths to their respective cables and racks/equipment. **1.3.3 The earthing arrangements at Depots, mainline stations and depot stations shall be provided by other designated contractors or depot contractors or S&T contractors as per Appendix A of Section -6B: Particular Specifications Signalling and Train Control.**
227	PART II A/ P24 PART-2- 1/ SECTION 6C_PARTICULAR SPECIFICATIONS_TELECOMMUNICATION/ **CH- 11/ APPENDIX- I/ CLAUSE 1.2.4.3.2**	The thickness of stainless-steel tape to alloy AISI 304 or 305 shall not be less than 0.125 mm. The height of the corrugation shall be minimum 0.6 mm and the pitch shall be 2.5 mm maximum. Outer jacket of 1.8mm minimum thickness HDPE shall be provided over the steel tape throughout the length of the cable.	~~The thickness of stainless-steel tape to alloy AISI 304 or 305 shall not be less than 0.125 mm. The height of the corrugation shall be minimum 0.6 mm and the pitch shall be 2.5 mm maximum. Outer jacket of 1.8mm minimum thickness HDPE shall be provided over the steel tape throughout the length of the cable.~~ **iv) Not used**
228	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 4, Clause No. 4.1 sub clause 4.1.1	The Train Control and Signalling System shall achieve all performance requirements specified in this PS	The Train Control and Signalling System **(which includes communication backbone)** shall achieve all performance requirements specified in this PS
229	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 4, Clause No. 4.2 sub clause 4.2.3	The Train Control and Signalling System shall achieve a Mean Time between Maintenance Action (MTBMA) of no less than 28 days per 17 route km approx of the Line. MTBMA is the average time between maintenance being	The Train Control and Signalling System shall achieve a Mean Time between Maintenance Action (MTBMA) of no less than 28 days per 17 route km approx of the Line. MTBMA is the average time between maintenance being

		required on a piece of equipment, sub-system or a system. The equipment shall be clubbed as (a) Trackside ATC (b) Onboard ATC (c) TMS (d) CBI including axle counter, signal, point machine etc and MTBMA of 28 days shall be achieved for each group.	required on a piece of equipment, sub-system or a system. ~~The equipment shall be clubbed as (a) Trackside ATC (b) Onboard ATC (c) TMS (d) CBI including axle counter,balise, signal, point machine etc and MTBMA of 28 days shall be achieved for each group~~.
230	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.4 Standards (1)	The product shall be compliant to 3GPP Rel. 16, upgradable to further releases supporting Railway/Public safety features and ultimately compliant to the emerging Future Rail Mobile Communication Standard (FRMCS) being developed by UIC. Broadly the solution provided should match with the feature set of FRMCS.	The product shall be compliant to 3GPP Rel. ~~16~~**15**, upgradable to further releases supporting Railway/Public safety features and ultimately compliant to the emerging Future Rail Mobile Communication Standard (FRMCS) being developed by UIC. Broadly the solution provided should match with the feature set of FRMCS**, on existing Hardware through software upgrade.**
231	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.4		**[Add the following new Sub Clause No. (9) in Clause No. 15.4 in PS]** The LTE sub contractor/OEM must have deployed one EPC along with RAN, generally compliant to 3GPP Rel. 15.
232	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.5	The proposed LTE system for the NCRTC RRTS Project consists of LTE System comprising of Passive Infra, Active Infra, EPC (Evolved Packet Core), MCX services (Hardware & Software), Cab Equipment, Handsets, Fixed Radios for stations/Depots/Sections, Dispatchers, NMS etc. and associated services The proposed LTE system for the DGM RRTS Corridor Project consists of the following as a minimum: . . .	The proposed LTE system for the NCRTC RRTS Project consists of LTE System comprising of Passive Infra, Active Infra, EPC (Evolved Packet Core), MCX services (Hardware & Software), **UEs (**Cab Equipment, Handsets, Fixed Radios for stations/Depots/Sections**) with SIM cards**, Dispatchers, NMS etc. and associated services **15.1.1** The proposed LTE system for the DGM RRTS Corridor Project consists of the following as a minimum: . .

		The scope of work to be performed is Design, Engineering, Supply, Installation, Testing and Commissioning, including the following . . . (5) The Systems shall be so designed as to have a minimum of 15 years of service life operating continuously . . . The proposed solution shall comply with the following: . . . (12) The Handheld, Fixed Radio and Train Radios (Voice + data, Cab LTE Modem & Data Only Radios etc) shall have GCF Interoperability Certification	. **15.1.2** The scope of work to be performed is Design, Engineering, Supply, Installation, Testing and Commissioning, including the following: . . . **15.1.3** The proposed solution shall comply with the following: . . . (5) The Systems shall be so designed as to have a minimum of 15 years of service life operating continuously~~.~~ **for the equipment (excluding Servers & workstations) For Servers & workstations it shall be 10 years**. . . . (12) The Handheld, Fixed Radio and Train Radios (Voice + data, Cab LTE Modem & Data Only Radios etc) shall have **PTCRB/**GCF **or equivalent** Interoperability certification**.**
233	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.6.3		**[Add the following new Sub Clauses (4) and (5) in Clause No. 15.6.3 in PS]** (4) General specifications of RF and Leaky Coaxial cable

			shall be as per appendix I and J. (5) All cable specifications have to be submitted for Employer's approval prior to procurement
234	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.6.4 (3)	EPC and RAN should support interoperability as per minimum 3GPP release 16 or latest	EPC and RAN should support interoperability as per minimum 3GPP release ~~16~~**15** or latest
235	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.3 (A)	The Evolved Packet Core (EPC) shall be compliant to the 3GPP Release 16 & later standards, ultimately compliant to the emerging Future Rail Mobile Communication Standard (FRMCS) being developed by UIC. Broadly the solution provided should match with the feature set of FRMCS	The Evolved Packet Core (EPC) shall be compliant to the 3GPP Release ~~16~~**15** & later standards, ultimately compliant to the emerging Future Rail Mobile Communication Standard (FRMCS) being developed by UIC. Broadly the solution provided should match with the feature set of FRMCS
236	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.3 (R)	EPC shall support Equal Cost Multi Path, ECMP for first level load balancing.	EPC shall support Equal Cost Multi Path, **S/P-GW and Backhaul shall support** ECMP for first level load balancing.
237	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.3		**[Add the following new Sub Clause (X) in Clause No. 15.7.1.3 in PS]** The EPC shall be supplied with industrial Firewall.
238	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.3		**[Add the following new Sub Clause (Y) in Clause No. 15.7.1.3 in PS]** The EPC shall have provisioning system that should be able to configure service parameters and acts as a central repository of data, along with HSS provisioning for quick

			integrations with another core network vendor, for other RRTS corridors
239	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.11		**[Add the following new Sub Clause (H) in Clause No. 15.7.11 in PS]** H. Support of content screening, white-lists and blacklists
240	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.13		**[Add the following new Sub Clause (12) in Clause No. 15.7.13 in PS]** 12. Rating group modifications.
241	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.17 (F) sub clause (6)	Rating group modifications.	~~Rating group modifications~~**Not Used**.
242	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.17(F)(7)	Multiple Gx interfaces (for the same session)	~~Multiple Gx interfaces (for the same session)~~ **Shall have capability to support multiple PCEF in the solution.**
243	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.17(H)	The PCRF shall support to manage mobile access congestion control	~~The PCRF shall support to manage mobile access congestion control~~**Not Used.**
244	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.17(J)	Support of content screening, white-lists and blacklists.	~~Support of content screening, white-lists and blacklists~~**Not used.**

245	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.1.17(P)	The PCRF shall provide a direct interface towards MME that will enable the launch of added value use cases.	The PCRF shall provide a direct interface towards ~~MME~~**S-GW** that will enable the launch of added value use cases.
246	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.2	**LTE Pole and Passive Infrastructure Specifications** Passive infra consist of Antenna and Antennae mounting arrangements, to be install/erected in areas including but not limited to Station, Viaduct, Depots and other NCRTC building. OHE Mast may be utilized for installation of wayside LTE Antenna if they meet the following criteria 1. The weight of the antenna and mounting arrangement is less than 20 kg. (Total weight per OHE mast is limited to 20 kg) 2. Clearance from 25 KV Catenary is maintained. If in the solution offered the weight of the antennas per site (including all sector antennas and their clamps) is more than 20 kg then the contractor's commercial quote should be inclusive of cost of Antenna Mounting Arrangement and its installation testing and commissioning	**LTE Pole and Passive Infrastructure Specifications** Passive infra consist of Antenna and Antennae mounting arrangements, to be install/erected in areas including but not limited to Station, Viaduct, Depots and other NCRTC building. ~~OHE Mast may be utilized for installation of wayside LTE Antenna if they meet the following criteria~~ ~~1. The weight of the antenna and mounting arrangement is less than 20 kg. (Total weight per OHE mast is limited to 20 kg)~~ 2. ~~Clearance from 25 KV Catenary is maintained~~. ~~If in the solution offered the weight of the antennas per site (including all sector antennas and their clamps) is more than 20 kg then t~~**T**he contractor's commercial quote should be inclusive of cost of Antenna Mounting Arrangement and its installation testing and commissioning**.**
247	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.2 (Q)	**Antennae location and mounting arrangement on the OHE poles/Antennae mounting arrangements, shall be finalised after interfacing with the traction and Civil contractors.**	**Antennae ~~location~~ and ~~mounting arrangement on the OHE poles/~~Antennae mounting arrangement's locations, shall be finalised after interfacing with the traction and Civil contractors.**
248	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause	**Inter MM.**	**Inter MME.**

	No. 15.7.4.3 (2) (2)		
249	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.4.4 (8)	(8) Operator defined QFI The system shall support operator defined QFI in addition to the 9 QoS profiles defined by 3GPP	(8) ~~Operator defined QFI~~**Not used.** ~~The system shall support operator defined QFI in addition to the 9 QoS profiles defined by 3GPP~~
250	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.6 (4)	Operating temp range: -10°to +65°Celsius	Operating temp range~~: -10°to +65°Celsius~~**as per clause 6.7.4.1 of chapter 6.**
251	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.7		**[Add the following new sub clause (4) in clause no 15.7.7 in PS]** (4) Mobile Device Management a. Mobile Device Management application/software shall automatically detect and configure all MCPTT UEs in the network with user data and seamless automatic device configuration. b. Device Management solution shall be able to remotely carry out device configuration, along with any frequent updates from the LTE network with real-time user information and device analytics.

252	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.8.3 (2)	The area of each Contractor defined sector shall not present any gaps which fall below the specified minimum SINR or RSR	The area of each Contractor defined sector shall not present any gaps which fall below the ~~specified~~ minimum SINR or RSR
253	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.10 sub clause Performance requirements (6)	(6) The LTE shall procure an end-to-end availability of 99.95% for an MCPTT dedicated radio bearer, with the following MTTR assumptions: 1. Mission Time: 24 hours 2. MTTR < 24 hours for MCPTT data application and UEs. 3. MTTR < 48 hours for EUTRAN and Backhaul Transmission components. 4. MTTR < 96 hours for EPC components	(6) ~~The LTE shall procure an end-to-end availability of 99.95% for an MCPTT dedicated radio bearer., with the following MTTR assumptions:~~ ~~1. Mission Time: 24 hours~~ ~~2. MTTR < 24 hours for MCPTT data application and UEs.~~ ~~3. MTTR < 48 hours for EUTRAN and Backhaul Transmission components.~~ ~~4. MTTR < 96 hours for EPC components~~ **Not used.**
254	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.7.11 (2)	The normative NCRTCs standard specification TS 22.289 which is proposed for 3GPP release 16 with all the NCRTCs specific features needs to comply with eventually and the contractor is expected to provide a roadmap for the same	The normative NCRTCs standard specification TS 22.289 which is proposed for 3GPP release 16 with all the NCRTCs specific features needs to comply with ~~eventually~~ and the contractor is expected to provide a roadmap for the same
255	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.1 (1)	Should support combined router/server	Should support ~~combined~~ router~~/server~~**.**
256	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.1 (2)	It should support Dual SIM with Active Standby. One SIM for NCRTC Captive LTE Network and the other SIM for MVNO Network. With Priority setting for NCRTC LTE Network	It should support Dual SIM ~~with Active Standby~~. One SIM **Slot** for NCRTC Captive LTE Network and the other SIM~~ for MVNO Network~~**.** ~~With Priority setting for NCRTC LTE Network~~ **slot for redundancy purpose.**
257	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause	Essential Services ETCS Data, MCPTT Voice and alarms and messages of other On-Board Units (e.g. TIMS, EVC, PA System etc) shall be primarily rerouted through the NCRTC LTE Network, whereas other	Essential Services ETCS Data, MCPTT Voice**,** ~~and~~ alarms and messages of other On-Board Units (e.g. TIMS, EVC, PA System etc) shall be primarily ~~re~~routed through the NCRTC LTE Network, whereas other

	No. 15.8.1 (3)	services such as On-Board CCTV Transmission, IoT and On-Board Advertisement etc shall be routed through the MVNO Network in case of failure of primary network.	services such as On-Board CCTV Transmission, IoT and On-Board Advertisement etc shall be routed through the ~~MVNO Network in case of failure of primary network~~ **LTE/Wireless Network.**
258	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.1 (6)	Shall support routing protocols include EIGRP, OSPF, GRE, mGRE	Shall support routing protocols include ~~EIGRP,~~ OSPF, GRE, mGRE
259	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.1 (13)	Data radios should transfer packet switched data over LTE network, with systems suitable for easy installation with European Train Control System (ETCS) equipment	~~Data~~**Cab** radios should transfer packet switched data over LTE network, with systems suitable for easy installation with European Train Control System (ETCS) equipment
260	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.1		**[Add the following new sub clause (19) in clause no 15.8.1 in PS]** (19) In case of failure of LTE Network, ETCS data shall be routed through Wireless Network.
261	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.8.4 (7)	Operation temperature should range from -40 to +85 degree Celsius	Operation temperature ~~should range from -4~~**0** ~~to +85degree Celsius~~ **range shall as per clause 6.7.4.1 of chapter 6.**
262	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.9 (4) Security, sub clause (iv)	Encrypted mass memory ›› Tampering detection ›› PGP encrypted email	~~Encrypted mass memory ›› Tampering detection ›› PGP encrypted email~~ **Not used.**
263	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.9 (4) Security, sub clause (v)	FIPS 140-2 compliant HW cryptography	~~FIPS 140-2 compliant HW cryptography~~ **Not used**

264	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.9 (5) Wireless connectivity, sub clause (i)	3GPP Release 16 and upgradable to FRMCS	3GPP Release ~~16~~**15** and upgradable to FRMCS
265	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.9 (5) Wireless connectivity, sub clause (ii)	Dual SIM with Active Standby (One SIM for NCRTC Captive usage LTE Network and another SIM for MVNO Network)	Dual SIM with Active Standby (One SIM for NCRTC Captive usage LTE Network and another SIM for ~~MVNO~~**any other** Network)
266	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause 15.9 (11) Certifications, sub clause (ii)	FCC, CE, PTCRB, GCF, NOM	FCC, CE, ~~PTCRB, GCF,~~ NOM **or equivalent certifications.**
267	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.11 (3)	Suitable configuration routers shall be used to cater to the project requirement and any additional load in future due to integration with other corridors. Configuration shall be such that 25% spare capacity in terms of throughput bandwidth and ports is left spare after taking into consideration the requirement of Delhi Ghaziabad Meerut Corridor and other two corridors.	Suitable configuration routers shall be used to cater to the project requirement and any additional load in future due to integration with other corridors. Configuration shall be such that 25% spare capacity in terms of throughput bandwidth **and ports** is left **spare** after taking into consideration the requirement of Delhi Ghaziabad Meerut Corridor and other two corridors.
268	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.11 (4)	Layer 3 device should comply to following Temperature performance parameters: i. Operating Temperature - min 0 to 65 °C ii. Storage Temperature - min 0 to 70 °C	Layer 3 device should comply ~~to~~**for** following Temperature performance parameters~~:~~ **as per clause 6.7.4.1 of chapter 6.** ~~i. Operating Temperature - min 0 to 65 °C~~ ~~ii. Storage Temperature - min 0 to 70 °C~~
269	Employers Requirement Part-2, Section 6B: PS-Signalling and Train control, Chapter 15, Clause No. 15.11 (6)	Device should have IP SLA monitoring (or equivalent functionality) for Latency, Packet drop, Jitter etc. and should also support SNMP polling for IP SLA monitoring	Device should have ~~IP SLA monitoring (or equivalent~~ functionality for Latency, Packet drop, Jitter etc. and should also support SNMP polling ~~for IP SLA monitoring~~

270	Employers Requirement Part-2, Section 6C: PS-Telecommunication, Appendix Q Clause 4.12		**[Add the following new clause (4.12.2) in clause 4.12 in PS]** All outdoor equipment shall be IP66 or higher.
271	Employers Requirement Part-2, Section 6C: PS-Telecommunication, Appendix Q Clause 5		**[Add the following new clause (5.2) in clause 5 in PS]** Please refer Appendix A and A1 of this chapter for interface requirements
272	Employers Requirement Part-2, Section 6C: PS-Telecommunication, Appendix Q		**[Add the following new clause (6) in PS]** 6. RAMS Requirements 6.1 Please refer to chapter 4 of section 6B: Signalling and Train Control of this Tender
273	Employers Requirement Part-2, Section 6C: PS-Telecommunication, Appendix Q		**[Add the following new clause (7) in PS]** 7. Cable Requirements 7.1 Please refer to Appendix I and J of section 6B and 6C for power, data and OFC cables etc

Enclosures:

1) **Section 6G: Particular Specification: Platform Screen Doors**
2) **Appendix V: KEY & ACCESS DATES – R1**
3) **Appendix C: List of TMS Workstations R1**
4) **Clause No.9 of Appendix D**
5) **Section 6E_Condition of Contract on safety, Health and Environment (SHE)**
6) **Correction Slip to Section 6E SHE Appendix III**
7) **APPENDIX – B - R2**
8) **Annexure TA-1**
9) **Section 6F: General Alignment Drawings**