



General Bid Bulletin No. 3

12 May 2021

THE MALOLOS-CLARK RAILWAY PROJECT AND THE NORTH-SOUTH RAILWAY PROJECT SOUTH LINE COMMUTER PACKAGE CP NS-01: PROCUREMENT OF ELECTRICAL AND MECHANICAL SYSTEMS AND TRACK WORKS (IFB No: 21-040-3)

TO ALL PROSPECTIVE BIDDERS:

This General Bid Bulletin is issued to amend/clarify certain provisions in the Bidding Documents for the above-mentioned Project. Please refer to the attached Annexes of this General Bid Bulletin for details:

1. **Annex "A"** — Clarifications to the Bidding Documents.
2. **Annex "B"** — Addendum to the Bidding Documents with "**Attachment 1**"
3. **Annex "C"** — Not Applicable

All other portions of the Bidding Documents not affected by these revisions, amendments and/or clarifications shall remain unchanged.

Revisions/amendments/clarifications made herein shall be conserved as an integral part of the Bidding Documents of this Project.

For your guidance and information.

For the Bids and Award Committee

SIGNATURE REDACTED

ENGR. JAIME M. NAVARRETE, JR
Chairperson,

Annex A

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Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
1	General – Notary of Documents	Kindly clarify on the requirements of Notarization/Apostille for documents being submitted by Foreign companies.		Will be based on the instruction in the ITB
2	Part 2 – Section VI Technical Requirements – Track Works General	Please provide the tolerances allowed in the viaduct structure, as it plays a major role in the estimation of concrete & steel for the track works.		The deck level tolerance shall typically be within +/-30mm.
3	Volume II Section VI SOW-2 4	c) Onboard equipment for Commuter, Limited express, MMSP trains and maintenance vehicles; as MMSP is CBTC radio, all others are ETCS-2, so MMSP trains may require additional equipment cabinet for ETCS-2 onboard equipment – please confirm or provide specifics.		No change. The MMSP trains run in MMSP line on CBTC signaling. These trains will run on SC section of NSCR line from Bicutan to Calamba on ETCS signaling. NS01 shall equip ETCS system in these trains. There shall be switchover of Signaling system at Bicutan station from CBTC to ETCS when MMSP train has to travel from Bicutan up to Calamba. While return journey to MMSP line, there shall be switchover of signaling from ETCS to CBTC at Bicutan station.
4	Volume II Section VI SOW-1&6	There is no Outline Integrated Operations Control Centre described in this SOW section. Please confirm it will be provided or not.		Clause revised. Please refer to Annex B.
5	Volume II Section VI ERG-36 4.20.5	It is expected that the Engineer will relay the coordinated information to the “yet to be		Reference to the Employer's Requirements - General Requirements Item 20 Interface

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		awarded” interface party to avoid any repetition of work; the Contractor can and will confirm such coordinated information to the awarded coordination party after award; please confirm.		Management, the Contractor shall participate in information transfer and management process e.g. prepare Interface Control Documents, Interface Matrix, to fulfill the Contractor’s interface obligations. The Interface Control Document shall be a “live” common document between each sub-system and other Contractors and external parties, which will be revised and re-submitted by the Contractor to ensure that it remains current, and at other times as directed by the Engineer. All the interface related information shall be recorded in the interface management tools e.g. Interface Control Document, interface matrix, etc. as stated in the Employer's Requirements. The Contractor shall provide the Interface Contractor with all information necessary to enable the Interface Contractor to follow-on and proceed with their coordination.
6	Volume II Section VI ERG-72 16.1.1	Reference clauses 15.2.1 and 15.2.2 are incorrect; please amend.		Clause revised. Please refer to Annex B.

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7	Volume II Section VI ERG-89 21.3.1	Please confirm that SSAP in 21.2.1 and this RAM Plan is the same plan.		The bidder's understanding is not correct, Clause 21.2.1 is related to System Safety Assurance Plan and Clause 21.3.1 is related to RAM (Reliability, Availability, and Maintainability) Plan
8	Volume II Section VI ERG-89 21.3.1	Please clarify if Rolling Stock RAM would be in the scope of NS-01 or others.		Rolling Stock RAM requirements is covered under separate Rolling Stock contract packages CP NS-02 and CP NS-03.
9	Volume II Section VI ERT-5 1.4.1 18) 18) Upon the Engineer's request, the Contractor shall submit any of the design drawings in digital form compatible with the Employer's facilities.	In the BIM requirements, the specification for submission of drawings are well defined; please clarify if there is additional or further need to provide other forms of digital format for drawings and what are the Employer's "facilities".		The format of deliverables are specified in the Employer's Requirements - General Requirements item 6.3. Other digital form can be Portable Document Format (PDF), DWG, DXF, RFA, or other common computer-aided design formats.
10	Volume II Section VI ERT-28 1.13.2 Rail Fastening Assembly for Concrete Sleepers for Ballast Tracks	Please clarify if there is need for stray current corrosion control isolating pad as in 1.13.1.		Isolating pad is part of fastening system for ballasted track in depots. See drawing MCRP-DWG-TK-0213 of Vol. III Part 2 (a) of the bid documents for the details of proposed fastening system for ballasted track.
11	Volume II Section VI ERT-83 2.4.1 Bullet point: There is an Option for ATO ERT-95 2.8.9.6 Ride Quality	Please clarify when will the ATO option be exercised. Wherein page ERT-95 clause 2.8.9.6 ATO is		Please refer Volume I, Part 1, Section IV. Bidding Forms (BF), Schedule 1 - Price Schedule , Preamble, clause 2. at BF-47 for details

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	ERT-103 2.11.2 Operating Modes	mentioned this time as “normal operating mode” and ATO is mentioned everywhere.		
12	Volume II Section VI ERT-84 2.4.1 Bullet point: Depot engine	In chapter 8, no Depot engine is mentioned; only shunting locomotives; please confirm if shunting locomotives are Depot engine?		The bidder's understanding is correct. Please refer Chapter 8, appendix 8.1, A N41.02 Shunting Locomotive (Engine Type).
13	Volume II Section VI ERT-106 2.11.9 Entering depot / depot transfer line	Description is for train exiting mainline into depot; train entering mainline from depot is not described – please provide.		Clause revised. Please refer to Annex B.
14	Volume II Section VI ERT-112 2.12.11 ATO System	Please clarify if this is an option to be exercised.		Please refer Volume I, Part 1, Section IV. Bidding Forms (BF), Schedule 1 - Price Schedule, Preamble, clause 2. at BF-47 for details
15	Volume II Section VI ERT-113 2.12.11.6 Door Opening in ATP mode	This ATP door opening is described under heading of ATO; is this misplaced?		Clause revised. Please refer to Annex B.
16	Volume II Section VI ERT-164 2.26.10.1 Interface of NSCR-EX with MMSP	Clauses in this section seems to contradict with respect to trains interoperability, clause 1 and 2 states trains will be running from NSCR-EX to MMSP and MMSP trains to NSCR-EX, then later part it states trains will run only on their respective lines. Please clarify.		No change. The MMSP trains run in MMSP line on CBTC signaling. These trains will run on SC section of NSCR line from Bicutan to Calamba on ETCS signaling. NS01 shall equip ETCS system in these trains. There shall be switchover of Signaling system at Bicutan station from CBTC to ETCS when MMSP train has to travel from Bicutan up to Calamba. While return journey to

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				MMSP line, there shall be switchover of signaling from ETCS to CBTC at Bicutan station.
17	Volume II Section VI ERT-183 2.33.14 Dynamic tests	Item no 1 is missing; assumed first para as item no 1; please confirm.		Clause revised. Please refer to Annex B.
18	Volume II Section VI ERG-55 10.5 Test Groups 10.5.1. / (1) Type test A Type test is a requirement for first production items in respect of each major component or assembly or sub-assembly, in order to demonstrate that design confirms to all relevant technical requirements,	In page ERT-175 Signaling System clause 2.33.2 and page ERT-1037 PSD System clause 10.7.4 clearly specify requirement of type test but other sub-system did not have similar clause. Clarify if same requirement for type test is applicable for Power Supply and Distribution Systems. Is it acceptable for Vendors / Manufacturers to submit existing type test reports if it is complying to same conditions in IFB?		Type tests are required for all equipment for all systems. Please refer to GBB No. 2
19	Volume II Section VI ERG-56 10.5 Test Groups 10.5.1 / (2) First Article Inspection The Engineer will advise any adjustments required and the Contractor shall prepare a visit	In case the manufacturing process of equipment has not been changed and the model of equipment used are proven and used in other railway projects, then the FAT of these equipment will be sufficient; no need for FAI, please confirm this condition.		Refer to GBB No. 2 item 113 All equipment shall be subject to FAI test.

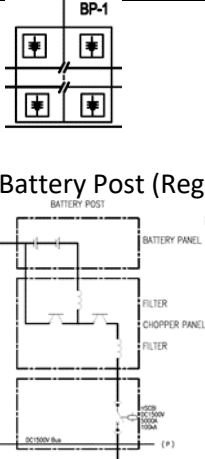
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	schedule for inspection of those items as required by the Engineer.			
20	Volume II Section VI ERG-61 12.9 / Software Rights 12.9.1 12.9.1. The Contractor shall ensure that the Employer/the Engineer or its licensee is granted all necessary rights to use software embodied in the equipment and there are no restrictions attached to the use of any information supplied by the Contractor which might later prevent or hinder the Employer/the Engineer or its licensee from modifying or adopting or extending the system.	We understand this clause is only applicable to other softwares which are to be directly used by the Employer. All embedded software are not subject to this clause. In case of supply of equipment using firmware, only the firmware installed in the equipment shall be provided. Any documentation related to firmware (including source codes, etc.) will not be supplied to Employer. Please confirm our understanding.		Please refer to GBB No. 2 item 115. If source code items done specifically for CP NS-01, then the source code should be the property of the Engineer. TBC The Contractor shall ensure that the Employer/the Engineer or its licensee is granted all necessary rights to use software embodied in the equipment and there are no restrictions attached to the use of any information supplied by the Contractor which might later prevent or hinder the Employer/the Engineer or its licensee from modifying or adopting or extending the system
21	Volume II Section VI ERG-184 Appendix 8 Outline Interface Demarcation with MMSP Power Supply (MMSP-NS01) Power simulation will cover CP107 trains running on the NSCR	Please provide train parameters and operation parameters for Battery Post Simulations. This request is not only CP107 but also all rolling stock parameters to be considered by NS01 contract.		The requested data will be shared once finalize and submitted by interfacing contractor.

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	(MMS-CP107) Train parameters shall be provided for the power simulation.			
22	Volume II Section VI ERT-362 "4 PSSI. (MCRP) 4.1 Scope of Works 4.1.1 General 6)" 6) The power supply equipment when in operation in normal and degraded mode shall not exceed the heat dissipation figures used in the sizing of the fans and air-conditioning used in the various rooms that house power supply equipment.	Please confirm if any heat dissipation figures of the equipment supplied under other Contract Packages have been provided in IFB.		The requested data will be shared once finalized and submitted by interfacing contractor.
23	Volume II Section VI ERT-364 4 PSSI. (MCRP) 4.1.3 System Overview 1) System Studies EMPLOYER'S REQUIREMENTS DRAWINGS Sheet 3-16 of 40 "ii. BP (Battery Post) traction power simulation studies; iii. Re-generating power absorbing	As per ERT, Regenerative power device is required aside from the battery posts. We understand this is the battery post (with battery panel) shown in the traction power feeding system and substation connection drawings. What is the difference in purpose between Battery Post and Substation Battery Post (Regenerative Power absorption device)? Battery Post x 4		The requested data will be shared by interfacing contractors during the preliminary design stage.

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	device study, specification and effect;"	 <p style="text-align: center;">Battery Post (Regen Absorption)</p>		
24	Volume II Section VI ERT-367 4 PSS I. MCRP 4.1.3 System Overview 7) Battery Post v. The BP system shall be utilized to safely bring passengers to the nearest station during adjacent TSS power failure. The BP's shall be sized to allow for multiple trains within the electrical	"Electrical sections" mentioned in this class is understood to be the electric companies (MERALCO, PELCO III, etc) section of supply. We understand BP size shall allow powering of trains in case a power failure in an electric company's franchise section. Please confirm.		Please refer to GBB No.2 Item 116 The bidder's understanding is correct.

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	sections to move out of the affected section.			
25	Volume II Section VI ERT-368 4 PSS I. MCRP 4.1.3 System Overview 10) TSS Equipment ii. Rectifier equipment AC Bus duct between Rectifier Transformer and Rectifier DC 1500V outdoor type metal enclosed air insulated switchgear with high-speed circuit breaker and disconnecting switch	This clause also mentions for busduct for outdoor DC1500V HSCB/DS panel. We understand AC bus duct is required only between rectifier transformer and rectifier equipment. DC Switchgear set including incoming panel from rectifier equipment is understood to be suitable for indoor installation and without any requirement for busducts. Please confirm.		Please refer to GBB No.2 Item 117 The bidder's understanding is correct.
26	Volume II Section VI ERT-372 4 PSS I. MCRP 4.3 Design Criteria and Standard 4.3.1 Design Life (3) Design life is 30 years;	We understand design life of 30 years (particularly for Battery Post) is in the condition that proper maintenance and recommended parts replacement be strictly observed. Please confirm		Refer to GBB No.2 Item 118 The bidder's understanding is correct.
27	Volume II Section VI ERT-372 4 PSS I. MCRP 4.3 Design Criteria and Standard 4.3.2 Proven Design 3) Sub-systems and equipment proposed by the Contractor shall have been in use	Supply record in other countries other than Philippines shall be applicable in the consideration of proven design. Please confirm.		Refer to GBB No.2 Item 119 The bidder's understanding is correct.

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	and have Railway System over a period of at least five years.			
28	Volume II Section VI ERT-372 4 PSS I. MCRP 4.3 Design Criteria and Standard 4.3.3 Adequate Design Margin 4.3.3 Adequate margin Adequate margin shall be built into the design particularly to take care of the higher ambient temperatures, dusty conditions, and high seasonal humidity, etc. prevailing in Manila.	Please provide concrete environmental conditions including ambient temperature, pollution degree, humidity, etc. for consideration of design.		Refer to GBB No.2 Item 120 Environmental conditions shall be determined by the contractor during preliminary design.
29	Volume II Section VI ERT-378 4 PSS I. MCRP 4.4 Technical Requirements 4.4.1 Switchgear (3) DC Switchgear 6) All DC switchgears shall be isolated from the ground and the switchgears shall be rigidly fixed to the floor with anchor bolts.	Is this clause pertaining to isolation from ground through the use of insulation mats between panel and ground? Please confirm. If yes, is it only to be applied for the DC switchgear set?		Refer to GBB No.2 Item 123 The insulated mat shall be used for the DC Switchgear and Negative Panel.
30	Volume II Section VI ERT-368, 380 4 PSS I. MCRP 4.1.3 System Overview	Can we offer either conventional mineral oil insulated transformer or eco-friendly oil insulated transformer? Please confirm.		Refer to GBB No.2 Item 124 The contractor shall provide eco-friendly oil immersed type transformer.

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	<p>4.4 Technical Requirements 4.4.2 Rectifiers and Rectifier Transformers 10) TSS equipment ii. Rectifier equipment 69kV/1180V gas insulated self- cooling or oil insulated transformer self-cooling Rectifier transformer (eco-friendly type); (2) Rectifier Transformers 8) Rectifier transformers shall be of oil insulated or gas insulated self-cooling type with an enclosed bus ducting or cable connection to the rectifier cubicle.</p>			
31	<p>Volume II Section VI ERT-380 4 PSS I. MCRP 4.4 Technical Requirements 4.4.3 Transformers (2) 69kV/6.6kV Distribution transformers 3)-d. d. Noise level: Permissible noise level shall comply with the Philippine environmental standard.</p>	<p>Please provide information on allowable noise level for transformers.</p>		<p>Refer to GBB No.2 Item 125 The reference for the determination of allowable noise level of transformers can be found in IEC 60076-10 or its equivalent standard.</p>

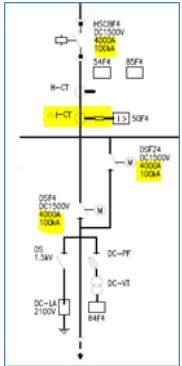
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32	Volume II Section VI ERT-383 4 PSS I. MCRP 4.4 Technical Requirements 4.4.5 BP (Battery Post) (1) The BP system consists of following; 1) Control Panel ... 2) Filter Panel/Chopper 3) DC switch panel 4) Capacitor panel 5) Resistor panel	The battery specification calls for capacitor panel and resistor panel as part of the battery post. What is the purpose of these panels? These are not necessary in case of battery based energy storage system for battery post application.		Refer to GBB No.2 Item 126 The stated parameters are for the conceptual design. During the preliminary design phase the contractor shall prepare a detailed design to achieve the performance requirements of the ERT. The contractor may submit an improve design which will be subject for the approval of the Engineer.
33	Volume II Section VI ERT-384 4 PSS I. MCRP 4.4 Technical Requirements 4.4.5 BP (Battery Post) (2) Rating and Specifications 5) Housing for BP shall be outdoor type.	Housing for the BP is not within the scope of the BP supplier/E&M supplier. Please confirm. Battery post (regenerative absorption device) for each substation is assumed to be for indoor installation within the substation. Please confirm.		Refer to GBB No.2 Item 127 The housing/panel for the BP in under the scope of NS-01. The equipment shall be indoor type.
34	Volume II Section VI ERT-386 4 PSS I. MCRP 4.4 Technical Requirements 4.4.6 Power SCADA (SCADA for Power Supply System) (5) Main Operating Facilities	Battery post/regenerative absorption device charge/discharge information is required to be sent to SCADA? Please confirm.		Refer to GBB No.2 Item 128 The bidder's understanding is correct.

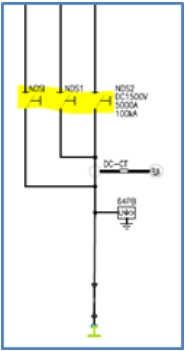
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	5) Records of energy demand and consumption and other data at electric companies incoming feeders, each station, traction and depot service substation for checking bills, for the electric companies' trend analysis and cost budgeting purposes;			
35	Volume II Section VI ERT-389 4 PSS I. MCRP 4.4 Technical Requirements 4.4.6 Power SCADA (SCADA for Power Supply System) (13) Substation Automation 1) The automation of substations shall be compliant with IEC61850.	Does this clause imply that connection to SCADA/RTU must be via IEC61850 protocol? Please confirm.		Refer to GBB No.2 Item 129 The bidder's understanding is correct.
36	Volume II Section VI ERT-414 4 PSS II. NSRP- South 4.1.2 System Requirements (2) TSS (Traction Substation) shall include 115kV or 34.5kV circuit breakers, Rectifier transformers, Rectifiers, DC 1,500V Switchgears, Re-generating devices, protective	Please clarify the requirement for regenerative devices in NSRP-South, if it is energy storage system the same as MCRP?		Energy storage system is only for MCRP.

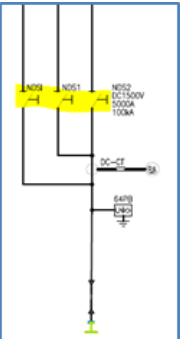
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	relays, cables and other, but not limited to, for train traction power, and 6.6kV substation cubicle with Distribution transformer for AC 6.6kV power supply.			
37	<p>Volume II Section VI "PART 2 – EMPLOYER’S REQUIREMENTS DRAWINGS</p> <p>4. Power Supply I. MCRP Sheet 5 of 40" Current transformer x 2 (ΔI-CT and H-CT) is required for each feeder.</p> 	<p>Instead of using separate ΔI-CT for ΔI protection, can we use the H-CT for Δ I protection? In this case, there is no need for 2 sets of CT's for each feeder. Please confirm.</p>		<p>Refer to GBB No.2 Item 132</p> <p>The design provided are for reference only, the contractor shall develop its own design for approval by the Engineer.</p>

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38	<p>Volume II Section VI "PART 2 – EMPLOYER’S REQUIREMENTS DRAWINGS 4. Power Supply I. MCRP Sheet 5 of 40" Negative Disconnecter (NDS) requirement is for a manual type of disconnecter.</p> 	<p>Is there a particular purpose for using manual type NDS? Is it possible to use either motor-type or manual-type? Please confirm.</p>		<p>Refer to GBB No.2 Item 133 The design provided are for reference only, the contractor shall develop its own design for approval by the Engineer.</p>
39	<p>Volume II Section VI "PART 2 – EMPLOYER’S REQUIREMENTS DRAWINGS 4. Power Supply I. MCRP Sheet 5 of 40" Negative panel H-CT (1H-CT, 2H-CT) are rated 4kA against 5000A</p>	<p>We understand this CT/Ammeter can be changed to suitable ratings. Please confirm.</p>		<p>Refer to GBB No.2 Item 134 The design provided are for reference only, the contractor shall develop its own design for approval by the Engineer.</p>

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	<p>rated output current for rectifier (also 54P HSCB, NDS rated current).</p> 			
40	<p>Volume II Section VI "PART 2 – EMPLOYER'S REQUIREMENTS DRAWINGS 4. Power Supply I. MCRP Sheet 3 of 40 Sheet 6 of 40" Traction Power Feeding System drawing shows 4000kW requirement for rectifier set of Substation No. 12. However, Substation Connection drawing of Substation No. 12 shows 6.5MW Rectifier Transformer and 6.0MW Rectifier specification.</p>	<p>Please confirm if 4000kW Rectifier Transformer / Rectifier sets is necessary.</p>		<p>Refer to GBB No.2 Item 135 Confirmed necessary.</p>

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41	Section III. Evaluation and Qualification Criteria EQC-8 BF-275 BF-276 BF-278 4.1 4.2 (a) 4.2(b)	<p>With regards to the General Experience (Form EXP-1), Specific Experience (Form EXP-2(a)) and Experience in Key Activities (Form EXP-2(b)), must the experiences provided be specifically from the contract signing entity (as a specialist subcontractor with a prime contractor) or experiences from affiliated companies (of the contract signing entity) are acceptable?</p> <p>For instance, if a specialist subcontractor is a corporation in Singapore, can we provide its experience references from its affiliated companies such a Corporation USA or a Corporation Europe?</p>		<p>The experience from affiliated companies are not acceptable, only the Bidder's share in the scope of works, shall be considered to meet this requirement.</p> <p>Reference to the Note (vi), the specialist subcontractor must satisfy the experience requirement of the same as prime contractor or subcontractor specified in Criteria Item No. 4.1.</p>
42	JICA Section I. Instructions to Bidders Part 1 – Bidding Procedures Section II. Bid Data Sheet Section VIII General Conditions ITB-5	<p>It is specified in 4.1 that A Bidder may be a firm that is a single entity or any combination of such entities in the form of a joint venture (JV). At the same time in the Section VIII. General Conditions, Art. 1.14 it is specified that the Contractor may form a joint venture, consortium, or other unincorporated grouping of two or more persons.</p> <p>For the purposes of cost minimization and lean</p>		<p>Formation of consortium is not eligible. Reference to the ITB 4.1, a Bidder may be a firm that is a single entity or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. Details of the intended percentage of financial participation of each member in the JV shall be provided in the Technical</p>

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	<p>BDS-9</p> <p>GC-13 4. Eligible Bidders 4.1</p> <p>ITB 22.2 Type of Entity</p> <p>Art, 1.14 Joint Several Liability</p>	<p>project management organization the Bidder is planning to bid as an unincorporated consortium, where 1) all members shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms, and 2) the consortium shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the consortium during the bidding process and, in the event the consortium is awarded the Contract, during Contract execution.</p> <p>Please advise whether a consortium formation will be eligible as a bidder too.</p>		<p>Bid, together with a statement regarding the proposed role and function of each member and the corporate relationships among the individual members. The agreement entered into between the JV members shall incorporate all such details.</p>

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43	General	<p>Regarding payment procedures</p> <p>Please clarify whether making payment or partial payments by the Employer to the separate accounts of the consortium (or JV) members (2 or 3 at most) based on the separate invoices (and other required supporting documents and evidence, as the case may be) for completed works will be acceptable.</p>		The bidder's request is not acceptable.
44	Volume 4 Section VIII PC-5 8.1 The Commencement of the Works planned date is November 1, 2021. Access dates are scheduled in Attachment 2.	The commencement of the works as specified in the contract data of ITB is planned for Nov. 1, 2021, but during the pre-bid conference for CP NS-01 project on April 16 2021 the presenter from GCR Consortium presented a slide in the PAQ Target of Commencement Date that DOTr target Commencement Date for package CP-NS-01 by 1st Jan, 2022.		Contract Data 8.1 has been updated. Refer to the Annex B and Annex B - Attachment 1 for the amendment detail.
45	Volume II Section VI ERT-211 3.2.2 10) FIDS	Please clarify if any FIDS is to be provided on board trains		FIDS will not be provided on board trains.
46	Volume II Section VI ERT-235 3.9.1 General	First paragraph seems incomplete ending with "his" – please clarify.		Clause revised. Please refer to Annex B.

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Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
47	Volume II Section VI ERT-239 3.9.4 Special Tool and Test Equipment; item 6) Software (with source code)	Please note that for software, if the source code is proprietary or IP protected, such source code of software will NOT be provided: please confirm this understanding.		If it's proprietary, and that software was not developed for this particular project, no need to provide. But if the source code was developed during and for this particular project to be used then it should be provided. This is subject to the Engineer's information and Employer's approval. Response to be referred to previous related question.
48	Volume II Section VI ERT-253,267 3.3 BTS and 2.6 Radio subsystems Availability figures	Please clarify the availability figures given in ERG-90 and ERG-91 to figures given in ERT such as these; 99.99% vs 99.96%; 99.98%.		Clause revised. Please refer to Annex B.
49	Volume II Section VI ERT-295 4.2 Preliminary Investigation	First paragraph states "Prior to the design, the Contractor shall survey the entire NSCR project area..." : please confirm that for NS-01 this refers only to the NS-01 NSCR areas.		The bidder's understanding is not correct, the entire NSCR Line or project which includes the N1 section in the preliminary investigation or survey. This is to familiarize the overall Radio System requirements especially on the Radio coverage as the NS01 Contractor will be interfacing with CP04 contractor with regards to the coverage overlaps to ensure seamless coverage; that there are no coverage holes or gaps and ensure reliable handovers that would impact the operations.

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Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
50	<p>Volume IV Part 3 - Conditions of Contract and Contract Forms Section VII General Conditions Page immediately before the "Contents" on Page GC-1 Section VII. General Conditions (GC) The General Conditions governing this Contract are the Standard General Conditions of Contract set forth in Part 3, Section VII of the Standard Bidding Documents for Procurement of Electrical and Mechanical Plant and for Building and Engineering Works, Designed by the Contractor (Trial Version) published by JICA in July 2015. Those General Conditions of Contract are available on the JICA's web site shown below:</p> <p>http://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/</p>	<p>We note that the General Conditions (GC) are not available to download from the DOTr portal like the rest of the bidding documents. They have however been provided as a hard copy when the bidding documents were purchased. We would like to have a PDF soft copy version and followed the link as provided in the reference text to the JICA site. The site does not have this document.</p> <p>Would you please provide the Section VII General Conditions document as a soft copy?</p>		<p>Reference to the Invitation For Bids (IFB) item 6, a complete set of the Bidding Documents (with General Conditions of Contract) may be purchased by interested Bidders upon the submission of a written application to the address indicated in item 5 of the IFB. For requests of the softcopy, please contact Procurement Services as detailed in IFB item 5.</p>

Annex B

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Annex B

ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
Volume I Part 1 – Bidding Procedures		
1	Part 2 – Conditions of Contract and Contract Forms VIII. Particular Conditions Part A – Contract Data Item 8.1 Page PC-5	Revised Contract Data 8.1
2	Part 2 – Conditions of Contract and Contract Forms VIII. Particular Conditions Part A – Contract Data Attachment 1 Page PC-12	Revised KD 2-4
3	Part 2 – Conditions of Contract and Contract Forms VIII. Particular Conditions Part A – Contract Data Attachment 2	Revised AD 3.6.2 and AD 4.3a.1

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
	Page PC-29	
Volume II Part 2 – Employer’s Requirements		
4	Volume II, Part 2 Section VI, Scope of Works (SOW)	Added clause 14
5	Volume II Part 2 Section VI. Item 16: Site Office and Site Office Management Clause 16.1.1 ERG-72	Revised clause 16.1.1.
6	ERG-90 Clause 21.3.6, Table 21.2	Revised Table 21.2
7	ERG- 129 ESMP-21, 34, Appendix 6 - Engineering Safety Management Plan	Revised clause 4.3.1
8	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR – Row: Signaling, Column: NSCR Interface at Malolos -NS01	Revised as follows: 'If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N2 and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.'

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
9	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR – Row: Signaling, Column: NSCR Interface at Malolos - CP04	Revised as follows: 'If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and N2 train detection system. CP04 and NS-01 shall coordinate to achieve this.'
10	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR – Row: Signaling, Column: NSCR Interface at Solis, Blumentritt and Tutuban Junction -NS01	Revised as follows: 'If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by SC and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.'
11	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR – Row: Signaling, Column: NSCR Interface at Solis, Blumentritt and Tutuban Junction - CP04	Revised as follows: 'If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and SC train detection system. CP04 and NS-01 shall coordinate to achieve this.'
12	ERG -179	Added text "civil"

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
	Appendix 8- Outline Interface Demarcation with NSCR: Trackwork, Column: NSCR Interface at Malolos -NS01	<p>Change the demarcation chainage to 34k749.01</p> <p>Added para in the cell</p> <p>'Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.'</p> <p>'Necessary track-bed construction at Civil demarcation line Ch. 34+749.081 (PR7-120 North of Malolos Station)'</p> <p>'Rail adjustment and connection at CP04 side for migration.'</p>
13	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR: Trackwork, Column: NSCR Interface at Malolos -CP04	<p>Change the demarcation chainage to 34k749.01</p> <p>Added para in the cell</p> <p>'Track bed and rail laying shall follow Civil demarcation line at Ch. 34+749.081 (PR7-120S at North of Malolos Station)'</p> <p>'Install Buffer stop.'</p>
14	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR: Trackwork, Column: NSCR	<p>Added para in the cell</p> <p>'Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.'</p>

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
	Interface at Solis, Blumentritt and Tutuban Junction -NS01	'Rail adjustment and connection at CP04 side for migration'
15	ERG -179 Appendix 8- Outline Interface Demarcation with NSCR: Trackwork, Column: NSCR Interface at Solis, Blumentritt and Tutuban Junction -CP04	Added text in the cell 'Install Buffer-stop'
16	ERG-182 Appendix 8-Outline interface demarcation with MMSP Row Signaling Column NS-01	(i) Replaced text 'CP04' by 'CP106' in Column NS01 and Row Signaling, first paragraph (ii) Added ' and CP107' in fourth paragraph
17	ERT-83 Clause 2.4.1, first para	Revised clause 2.4.1
18	ERT-84 Clause 2.4.1 bullet point	Revised clause 2.4.1
19	ERT-89 Clause 2.7.1 16)	Revised clause 2.7.1 16)
20	ERT-90 Clause 2.8.1 6)	Revised clause 2.8.1 6)

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
21	ERT-106 Clause 2.11.9	Revised clause 2.11.9
22	ERT - 110,111,112,113 Clause 2.12.10 and 2.12.11	Revised clause 2.12.10 and 2.12.11
23	ERT-149, Clause 2.18.6	Revised clause 2.18.6
24	ERT-150 Clause 2.19.1 para 4	Revised clause 2.19.1 para 4
25	ERT-166 Clause 2.26.10.2 6.	Revised clause 2.26.10.2 6.
26	ERT -183 Clause 2.33.14	Revised clause 2.33.14
27	ERT – 1070, Clause 12.1.1, para 3	Revised clause 12.1.1
28	ERT-1075, Clause 12.7, viii)	Revised clause 12.7
29	ERT-218	Revised clause 3.3.2
30	ERT-224	Revised Table 3.4.3
31	ERT-338	Revised Appendix 6 clause 2.2
32	ERT-321	Revised clause 2.2.1

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
	Clause 2.2.1 System Configuration.	
33	ERT-214	Revised clause 3.3.2
34	ERT-230	Revised clause 3.6.3
35	ERT-231	Revised clause 3.6.3
36	ERT-241	Revised Table 3.11.2.1
37	ERT-243	Revised Table 3.11.2.1
38	ERT-248	Revised Table 3.11.2.1
39	ERT-323 Clause 2.2.2 System Requirements.	Revised clause 2.2.2
40	ERT-329 Section 15- Requirements for CCTV Video Analytics System.	Revised clause 2.2.2 15)
41	ERT-253	Revised clause 3.3

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ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
	Clause 3.3 Availability	
42	ERT-267 Clause 2.5 Reliability Requirements.	Revised clause 2.5
43	ERT-235 Paragraph 3	Revised clause 3.9.1
Volume III Part 2 – Employer’s Requirements d) Employer’s Drawings		
44	MCRP-DWG-GEN-TK- 0408	TYPICAL DRAINAGE SYSTEM FOR BALLASTLESS TRACK
45	MCRP-DWG-GEN-TK- 0142	TYPICAL SHEAR CONNECTOR ARRANGEMENT ON ELEVATED SECTION
46	MCRO-DWG-GEN-TK- 0200	TYPICAL DETAILS OF SEF SYSTEM ON TRACK BED

Annex B – Attachment 1

		<p>Amount.</p> <p>The amount of the Performance Security will be reduced in accordance with the provision of PC Sub-Clause 4.2.</p>
General Design Obligations	5.1	<p>Period for notifying errors, faults and defects in the Employer's Requirements: ninety (90) days.</p>
Normal working hours	6.5	<p>Work on the site is permitted 24 hours a day, 7 days a week.</p> <p>9 hours shift working inclusive of 60 minutes meal period is permitted. However, overtime at the Contractor's expense will be permitted in accordance with Clause 6.5 (b) of the GC, subject to compliance with the applicable rules and regulations of Philippines Labor Codes.</p> <p>Each worker shall have a minimum of one rest day per week.</p>
Commencement of Works	8.1	<p>The Commencement of the Works planned date is January 1, 2022. Access dates are scheduled in Attachment 2.</p>
Delay damages for the Works	8.7	<p>Five hundredths of a percent (0.05%) of the Accepted Contract Amount per day for the completion of the whole of the Works and for delay in achieving each Key Date for the respective elements of the Works.</p> <p>Refer to Table: Summary of Sections below.</p>
Maximum amount of delay damages	8.7	<p>The maximum amount for cumulative delay damages for the Contract shall not exceed ten percent (10%) of the final Contract Price.</p>
Provisional Sums	13.5.(b)(ii)	<p>Fifteen percent (15%) of the actual amounts paid (or due to be paid) by the Contractor.</p>
Total advance payment	14.2	<p>One overall Advance Payment of fifteen percent (15%) of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable</p>

		<p>Amount.</p> <p>The amount of the Performance Security will be reduced in accordance with the provision of PC Sub-Clause 4.2.</p>
General Design Obligations	5.1	<p>Period for notifying errors, faults and defects in the Employer’s Requirements: ninety (90) days.</p>
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Commencement of Works	8.1	<p>The Commencement of the Works planned date is November-January 1, 20212022. Access dates are scheduled in Attachment 2.</p>
Delay damages for the Works	8.7	<p>Five hundredths of a percent (0.05%) of the Accepted Contract Amount per day for the completion of the whole of the Works and for delay in achieving each Key Date for the respective elements of the Works.</p> <p>Refer to Table: Summary of Sections below.</p>
Maximum amount of delay damages	8.7	<p>The maximum amount for cumulative delay damages for the Contract shall not exceed ten percent (10%) of the final Contract Price.</p>
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	Running using CP 03 Rolling Stock prior to commencement of Trial Running and Performance Testing.	
KD 1-3	Achievement: Completion of Training and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals for the Platform Screen Doors	37
Completion of Section 1	Achievement: Acceptance of the Platform Screen Door system for Section 1 certified as Substantially Complete.	37

Section 2: the Malolos-Clark Railway Project (MCRP). Approximate length of 50.5 km and 6 stations)

Key Date	Description	Month No.
KD 2-1	Design collaboration with N-1 CP 03 Contractor of North-South Commuter Railway Project (Malolos-Tutuban) (NSCR), for Signaling, Telecommunications and other on-board systems equipment.	12
KD 2-2	Achievement: Substantial Completion of Power Supply and Distribution at Depot to achieve “Power On” for full operation	30
KD 2-3	Achievement: Substantial Completion of Power Supply to all stations to achieve “Power On” for all station.	30
KD 2-4	Achievement: Supply of On-board Equipment including all accessories and fittings at the premises of the Rolling Stock Contractors in Japan/or elsewhere as advised. Key Dates KD 2-4 is sub-divided as shown below;	
	KD 2-4.1: Supply to CP NS-02 Contractor for 1 st trainset & CP NS-03 Contractor for trainsets 1-7.	27
	KD 2-4.2: Supply to CP NS-02 Contractor for trainsets 2 to 5	27
	KD 2-4.3: Supply to CP NS-02 Contractor for trainsets 6 to 10	31
	KD 2-4.4: Supply to CP NS-02 Contractor for trainsets 11 to 15	36
	KD 2-4.5: Supply to CP NS-02 Contractor for trainsets 16 to 19	40
KD 2-5	Achievement: Substantial Completion of all essential workshop equipment, rolling stock equipment, rescue equipment and other equipment, apparatus, etc. required for to commencing Integrated Testing and Commissioning using rolling stock and Test Running at Mainline and Depot for full operation.	31

	Running using CP 03 Rolling Stock prior to commencement of Trial Running and Performance Testing.	
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		AD 3.5.2: Railway Signal and Telecommunications Room	
		a. San Pedro,	34
		b. Pacita,	32
		c. Binan,	32
		d. Santa Rosa	34
	CP S-06	AD 3.6.1: Railway Electrical Room	
		a. Cabuyao,	34
		b. Banlic,	32
		c. Calamba	34
		AD 3.6.2: Railway Signal and Telecommunications Room	
		a. Cabuyao,	35
		b. Banlic,	33
		c. Calamba	35
	CP S-07	AD 3.7.1: South Depot Section Post	36
AD 4	Access to all stations, concourse paid/unpaid area including station platform floor for allowing CP NS-01 Contractor to commence and continue installation of AFC and PSD including related E&M systems/subsystems works.		
	Access Date 4 is subdivided into following:		
	CP S-02	AD 4.2.1:	
		a. Espana,	41
		b. Santa Mesa,	44
		c. Paco	46
	CP S-03a	AD 4.3a.1:	
		a. Buendia,	54
		b. EDSA,	54
		c. Nichols	50
	CP S-03b	AD 4.3b.1:	
		a. FTI	68

		AD 3.5.2: Railway Signal and Telecommunications Room	
		a. San Pedro,	34
		b. Pacita,	32
		c. Binan,	32
		d. Santa Rosa	34
	CP S-06	AD 3.6.1: Railway Electrical Room	
		a. Cabuyao,	34
		b. Banlic,	32
		c. Calamba	34
		AD 3.6.2: Railway Signal and Telecommunications Room	
		a. Cabuyao,	3435
		b. Banlic,	3233
		c. Calamba	3435
	CP S-07	AD 3.7.1: South Depot Section Post	36
AD 4	Access to all stations, concourse paid/unpaid area including station platform floor for allowing CP NS-01 Contractor to commence and continue installation of AFC and PSD including related E&M systems/subsystems works.		
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	CP S-02	AD 4.2.1:	
		a. Espana,	41
		b. Santa Mesa,	44
		c. Paco	46
	CP S-03a	AD 4.3a.1:	
		a. Buendia,	54
		b. EDSA,	54
		c. Nichols	5046
	CP S-03b	AD 4.3b.1:	
		a. FTI	68

Employer's Requirements

a) Scope of Works (SOW)		
1.	General	SOW-1
2.	Scope of Contract	SOW-1
3.	Outline of Track Works	SOW-2
4.	Outline of Signaling System	SOW-2
5.	Outline of Telecommunications	SOW-3
6.	Outline of Power Supply System	SOW-3
7.	Outline of Power Distribution System	SOW-3
8.	Outline of the Overhead Contact Line System	SOW-4
9.	Outline of Automatic Fare Collection System	SOW-4
10.	Depot Facilities	SOW-4
11.	Outline of Training Facilities at Training Center	SOW-4
12.	Outline of Platform Screen Door System	SOW-6
13.	Outline of the Computerized Maintenance Management System	SOW-6
14.	Outline for Integrated Operation control center (IOCC) and Depot Control Center (DCC)	SOW-6
 b) General Requirements (ERG)		
1.	Application of the General Specification	ERG-1
1.1	General	ERG-1
1.2	Definition and Abbreviations	ERG-1
2.	Mobilization	ERG-4
2.1	Contractor's Mobilization Program	ERG-4
2.2	Mobilization Requirements	ERG-5
3.	Temporary Facilities for the Contractor	ERG-5
3.1	General	ERG-5
3.2	The Contractor's Site Offices	ERG-6
3.3	Contractor's Labor Accommodation and Camps	ERG-6
3.4	Warehouse/Store	ERG-6
3.5	Vehicles	ERG-7
3.6	Utilities for Temporary Facilities	ERG-7
3.6.1	Water	ERG-7
3.6.2	Temporary Power and Lighting	ERG-7
3.6.3	Air Conditioning	ERG-7
3.6.4	Telephone	ERG-7
3.6.5	Internet	ERG-8
3.6.6	Sanitation	ERG-8
3.6.7	Drainage	ERG-8
3.6.8	Fire	ERG-8
3.7	Maintenance of Temporary Facilities	ERG-8
3.8	Damage to Existing Property	ERG-8
3.9	Access to Temporary Facilities Sites	ERG-9

Employer's Requirements

a)	Scope of Works (SOW)	
1.	General	SOW-1
2.	Scope of Contract	SOW-1
3.	Outline of Track Works	SOW-2
4.	Outline of Signaling System	SOW-2
5.	Outline of Telecommunications	SOW-3
6.	Outline of Power Supply System	SOW-3
7.	Outline of Power Distribution System	SOW-3
8.	Outline of the Overhead Contact Line System	SOW-4
9.	Outline of Automatic Fare Collection System	SOW-4
10.	Depot Facilities	SOW-4
11.	Outline of Training Facilities at Training Center	SOW-4
12.	Outline of Platform Screen Door System	SOW-6
13.	Outline of the Computerized Maintenance Management System	SOW-6
<u>14.</u>	<u>Outline for Integrated Operation control center (IOCC) and Depot Control Center (DCC)</u>	<u>SOW-6</u>
b)	General Requirements (ERG)	
1.	Application of the General Specification	ERG-1
1.1	General	ERG-1
1.2	Definition and Abbreviations	ERG-1
2.	Mobilization	ERG-4
2.1	Contractor's Mobilization Program	ERG-4
2.2	Mobilization Requirements	ERG-5
3.	Temporary Facilities for the Contractor	ERG-5
3.1	General	ERG-5
3.2	The Contractor's Site Offices	ERG-6
3.3	Contractor's Labor Accommodation and Camps	ERG-6
3.4	Warehouse/Store	ERG-6
3.5	Vehicles	ERG-7
3.6	Utilities for Temporary Facilities	ERG-7
3.6.1	Water	ERG-7
3.6.2	Temporary Power and Lighting	ERG-7
3.6.3	Air Conditioning	ERG-7
3.6.4	Telephone	ERG-7
3.6.5	Internet	ERG-8
3.6.6	Sanitation	ERG-8
3.6.7	Drainage	ERG-8
3.6.8	Fire	ERG-8
3.7	Maintenance of Temporary Facilities	ERG-8
3.8	Damage to Existing Property	ERG-8
3.9	Access to Temporary Facilities Sites	ERG-9

- i) Platform Screen Door System
 - i. Automatic Sliding Door sets
 - ii. Fixed Screens and emergency escape doors
 - iii. Local control panel for driver
 - iv. Local control panel for the station staff
 - v. Power Supply Distribution panel
 - vi. Interface Control Panel with Signaling
 - vii. Workstation and display screen
- j) Computerized Maintenance Management System
 - i. CMMS Workstation
 - ii. Field Devices

System details are described in ERT.

12. Outline of Platform Screen Door System

The outline of Platform Screen Door Systems is as follows;

- a) Installation of Half Screen Door type and/or Full-Screen Door Type for stations on MCRP, NSRP-South, and NS.
 - b) All Cable Containment and supports for the system.
- System details are described in ERT.

13. Outline of Computerized Maintenance Management System

The outline of Computerized Maintenance Management Systems (CMMS) is as follows;

- a) Provision of complete CMMS systems for the whole of the NSCR line that shall capture and schedule maintenance processes including:
 - i. Planned Maintenance
 - ii. Preventative Maintenance
 - iii. Engineering/Maintenance Projects,
 - iv. Maintenance Repair Operations/Overall (MRO) parts reorder
 - v. MRO parts cycle count,
 - vi. MRO parts receiving
 - vii. Recording of key events

System details are described in ERT.

14. Outline for Integrated Operation control center (IOCC) and Depot Control Center (DCC)

The outline of Integrated Operation control center and DCC is as follows

- a) The complete E & M systems from Clark International Airport to Calamba line will ultimately be controlled from an Integrated Operations Control Center (IOCC) located at Mabalacat Depot. The contractor shall design install and commission IOCC.
 - b) The IOCC shall have facilities to monitor and control complete line seamlessly for smooth operations and management.
 - c) The IOCC shall include control transfer from:-
 - (i) NSCR N1 initially controlled from OCC at Malanday Depot in Valenzuela,
 - (ii) MCRP line initially controlled from OCC at Mabalacat Depot.
 - (iii) NSRP – South initially controlled from OCC at Banlic.
 - (d) Each Depot (Mabalacat and Banlic) shall have its own Depot Control Center (DCC). The Contractor shall provide E&M facilities in the Depot for efficient Operations and management. The Depot control for Banlic depot shall be located in Banlic OCC. The Depot control for Mabalacat depot shall be located in OCC/IOCC Building in Mabalacat.
- System details are described in ERT.

End of Section

- i) Platform Screen Door System
 - i. Automatic Sliding Door sets
 - ii. Fixed Screens and emergency escape doors
 - iii. Local control panel for driver
 - iv. Local control panel for the station staff
 - v. Power Supply Distribution panel
 - vi. Interface Control Panel with Signaling
 - vii. Workstation and display screen
- j) Computerized Maintenance Management System
 - i. CMMS Workstation
 - ii. Field Devices

System details are described in ERT.

12. Outline of Platform Screen Door System

The outline of Platform Screen Door Systems is as follows;

- a) Installation of Half Screen Door type and/or Full-Screen Door Type for stations on MCRP, NSRP-South, and NS.
 - b) All Cable Containment and supports for the system.
- System details are described in ERT.

13. Outline of Computerized Maintenance Management System

The outline of Computerized Maintenance Management Systems (CMMS) is as follows;

- a) Provision of complete CMMS systems for the whole of the NSCR line that shall capture and schedule maintenance processes including:
 - i. Planned Maintenance
 - ii. Preventative Maintenance
 - iii. Engineering/Maintenance Projects,
 - iv. Maintenance Repair Operations/Overall (MRO) parts reorder
 - v. MRO parts cycle count,
 - vi. MRO parts receiving
 - vii. Recording of key events

System details are described in ERT.

14. Outline for Integrated Operation control center (IOCC) and Depot Control Center (DCC)

The outline of Integrated Operation control center and DCC is as follows

a) The complete E & M systems from Clark International Airport to Calamba line will ultimately be controlled from an Integrated Operations Control Center (IOCC) located at Mabalacat Depot. The contractor shall design install and commission IOCC.

b) The IOCC shall have facilities to monitor and control complete line seamlessly for smooth operations and management.

c) The IOCC shall include control transfer from:-

(i) NSCR N1 initially controlled from OCC at Malanday Depot in Valenzuela,

(ii) MCRP line initially controlled from OCC at Mabalacat Depot.

(iii) NSRP – South initially controlled from OCC at Banlic.

(d) Each Depot (Mabalacat and Banlic) shall have its own Depot Control Center (DCC). The Contractor shall provide E&M facilities in the Depot for efficient Operations and management. The Depot control for Banlic depot shall be located in Banlic OCC. The Depot control for Mabalacat depot shall be located in OCC/IOCC Building in Mabalacat.

System details are described in ERT.

End of Section

comply with the Technical Requirements (ERT) and given a Notice of No Objection by the Engineer.

- 21.3.2. The RAM Plan shall set out the principles by which RAM targets as specified in Employer’s Requirements – Technical Requirements (ERT) are compliant for different Rail Systems and the RAM activities undertaken by the Contractors to achieve them.
- 21.3.3. Specific RAM Plans shall be developed by the Contractors for their scope of work that set out responsibilities of RAM requirements, team members, methodologies, tasks, task flow, progress reporting, and a description of reporting, reviews, and RAM deliverables.
- 21.3.4. The RAM Plan shall be applicable to design, development, production, installation, testing and commissioning, operation, and maintenance phases of the works.
- 21.3.5. The Contractor shall submit the RAM Plan for review by the Employer. The first draft of these plans shall be submitted to the Employer for review within 90 days of the Commencement Date of the Works.
- 21.3.6. All RAM calculations shall use an annual operation of 19 hours a day, 7 days a week, with engineering downtime of 5 hours a day.

For E&M Systems and Trackwork to achieve 99.95% or above, operational (timetable) service availability, the system shall be inherently fault-tolerant. Single point failures that are not safety-critical shall not cause a train service to be delayed or interrupted.

Table 21.2: E&M systems and Track works RAM Targets

Item	System	RAM Target	
		Availability (%)	MTTR
1	Track	99.96%	4 hours
2	Signalling	99.98%	0.5 hours
3	Backbone Transmission System (BTS)	99.99%	4 hours
4	Public Address System (PA)	99.95%	0.5 hours
5	Passenger Information System (PIS)	99.95%	0.5 hours
6	Power SCADA	99.99%	0.5 hours
7	CCTV	99.95%	0.5 hours
8	Power Supply	99.995%	0.5 hours
9	Power Distribution	99.995%	0.5 hours
10	Overhead Catenary System (OCS)	99.995%	0.5 hours
11	Automatic Fare Collection (AFC)	99.5%	0.5 hours
12	Depot Equipment	95%	4 hours
13	Radio System (GSM-R)	99.99%	4 hours
14	Voice and Data system (office telephone & data)	99.8%	0.5 hours

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14	Voice and Data system (office telephone & data)	99.8%	0.5 hours

No.	Field Name	Field Description
19	Inherent Severity	The evaluated severity of the credible worst-case accident before consequence control measures are considered. Refer to Table 6.
20	Inherent Risk Ranking	The evaluated inherent risk. Refer to Table 7.
Mitigations		
21	Control Measure & Requirements	Description of the risk reduction measures that are planned and documented to reduce the likelihood/consequence of the hazard being realized.
22	Control Measure Owner	Identifies the Owner(s) of Control Measure
23	Residual Likelihood	The evaluated likelihood that the hazard and its credible worst-case consequence are realized after cause control measures are considered. Refer to Table 5
24	Residual Severity	The evaluated severity of the credible worst-case accident after consequence control measures are considered. Refer to Table 6.
25	Residual Risk	The evaluated residual and ALARP risk. Refer to Table 7.
26	ALARP statement	A summary statement to support the claim that the residual risk is ALARP
27	Comments	Any additional comments to note.

Hazard Logs shall be maintained throughout the Project Life cycle, with regular updates, until eventually all hazards are closed. Hazard Logs shall be recorded in a Requirement Management tool recommended by the Engineer, along with requirements and assumptions, in order to facilitate traceability and linking between safety requirements and hazards.

4.3.2. Closure of Hazards

A hazard may be considered closed when all safety requirements pertaining to the hazard have been implemented and validated, with approval from the Engineer and Employer.

4.3.3. Transfer of Hazards

A hazard may be transferred from one stakeholder to another when it is agreed that the control of the hazard falls within the responsibility of the latter. Such transfer, agreed by all concerned parties, must be documented in a hazard transfer sheet, so that it can ultimately be notified to and approved by the Engineer and the Employer. In case of disagreement between interfacing parties, Employer shall be called upon for arbitration.

4.3.4. Interface Hazards Management

Certain hazards arising at interfaces may have joint ownership between different stakeholders. This is the case for instance when a hazard is controlled by safety requirements to be implemented by more than one stakeholder. For these interface hazards, a clear allocation of responsibility must be established.

When interfaces are within the scope of one main Contractor (e.g. a Consortium), then it is up to this Contractor to allocate responsibilities and manage subsequently the resolution of the hazards across the involved stakeholders. This shall be however subject to supervision from the Employer and the Engineer .

When interfaces concern different Contractors, the Operator, or external organizations, then it is up to the involved stakeholders to agree on responsibilities and manage subsequently the resolution of the

No.	Field Name	Field Description
8	Function	The specific subsystem function, interface or O&M task under consideration.
9	Component	The constituents of the individual sub-system.
10	Interfacing Parties	This Attribute applies to interface Hazards and identifies the other Interfacing Contractors that are concerned by the Hazard (in its prevention or mitigation).
11	Interfacing Parties - Systems	The interfacing systems or sub-systems provided by the Interfacing Contractors.
12	Hazard Description	A description of situation or circumstance in which there is a potential for an accident to occur that may cause injury or fatality to personnel.
13	Cause of Hazard	The events, circumstances or conditions that result in the creation of the hazard.
14	Consequence of Hazard	A description of the resultant actual harm to persons.
15	Population at Risk	Describes the population (Passengers, Staff, Members or the Public) at risk due to the hazard.
16	Hazard Leader	This Attribute identifies the Leader of an Interface Hazard.
17	Hazard Leader - System	The System that is responsible for the management of the hazard.
18	Inherent Likelihood	The evaluated likelihood that the hazard and its credible worst-case consequence are realized before cause control measures are considered. Refer to Table 5.
19	Inherent Severity	The evaluated severity of the credible worst-case accident before consequence control measures are considered. Refer to Table 6.
20	Inherent Risk Ranking	The evaluated inherent risk. Refer to Table 7.
Mitigations		
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Hazard Logs shall be maintained throughout the Project Life cycle, with regular updates, until eventually all hazards are closed. Hazard Logs shall be recorded in a Requirement Management tool recommended by the Engineer, along with requirements and assumptions, in order to facilitate traceability and linking between safety requirements and hazards.

1.1.1.4.3.2. Closure of Hazards

Appendix B Generic Safety Requirements

Serial No.	Safety Requirement Description	Subsystem
SR-01	The ETCS System shall monitor the time elapsed from one platform up to the next platform, for a train passing through a tunnel section. In case the time elapsed is larger than a threshold (to be agreed with the Engineer in further design stage), an alarm shall be triggered in the OCC.	SIG
SR-02	The ETCS System shall apply Emergency Brakes for a moving train, if an unauthorized mode is selected.	SIG
SR-03	In Off mode, the ETCS System shall command 100% braking effort, and shall command Emergency Brakes if movement is detected.	SIG
SR-04	Failure of fallback signals shall not result in degradation of ETCS normal operation.	SIG
SR-05	In case of a signaling system failure, a driver shall be able to drive the train at low speed without full ATP protection.	SIG
SR-06	The ETCS system shall ensure the safe metro operation of all rail vehicle movements on all tracks.	SIG
SR-07	The System shall prevent a controlled train from travelling in the opposite direction of its Movement Authority.	SIG
SR-08	The ETCS System shall ensure the train stops safely before a buffer (end of guideway).	SIG
SR-09	In the event of a single brake system failure, the guaranteed minimum emergency brake rate shall not be less than 1.04m/s ² .” to ensure safe train separation is maintained.	SIG
SR-10	The ATP equipment shall be of "fail-safe design" with high availability and designed in accordance with SIL 4 requirements as stipulated in standards indicated in the applicable specifications	SIG
SR-11	The ETCS System shall apply the train Emergency Brake when it detects movement in the opposite authorized direction of travel for which the cumulative distance is greater than the maximum rollback tolerance distance.	SIG
SR-12	The ETCS System shall prevent train movement of controlled trains inside a traction power off area.	SIG
SR-13	The ETCS System shall ensure that a train does not depart a station until the "Closed and Locked" Status indicates all doors are closed and locked.	SIG
SR-14	When stopping at a platform, the ETCS System shall ensure that train doors on the opposite (non-opening) side of the train remain "Closed and Latched".	SIG
SR-15	The train shall stop within ±300 mm limits in order to enable automatic opening of ASDs (Automatic Sliding Door) through interfacing signals with the signaling	SIG

Serial No.	Safety Requirement Description	Subsystem
	system.	
SR-16	The ETCS System shall prevent approaching trains from entering the power section occupied by the incident train.	SIG
SR-17	All ATP functions shall be vital functions and shall be designed and implemented in accordance with relevant standards. The Safety Integrity Level (SIL) shall be as follows: - ATP: SIL4 - CBI: SIL4 - Train Detection system: SIL4 - Radio Block Center (RBC): SIL4 - ATS (Signaling Supervision): SIL2 - Signaling False Starting Protection: SIL4 - Signaling Train Over Run Protection: SIL 4 - Signaling Speed Restriction: SIL 4 - Power SCADA (Safety Functions): SIL 2 - ATP on-board equipment: SIL4. -PSD system: SIL 2 -PSD interface with Signaling (Vital Signals): SIL 4.	SIG, TEL
SR-18	The signals shall be installed at the trackside at breaking distance and visible to the Driver's eye view level	SIG
SR-19	Train washing mode shall be automatically selected before trains pass through the washing plant. The speed shall be controlled at a low safe speed and avoid sudden accelerations.	SIG, RS
SR-20	The train shall not be able to move if one or more doors are not closed and locked. In case a door is unable to close or lock, it is possible to manually close and isolate it, so that the train can be withdrawn from service in Automatic Mode. In emergency cases passengers shall be able to open the door system from inside or outside of the train.	SIG, RS
SR-21	All buffer stops shall be positioned such that the required braking length can be safely achieved.	SIG, TRK
SR-22	Cables shall be fire retardant as a minimum according to IEC 60332-3.	All
SR-23	Cables shall be of zero halogen type according to IEC 60754-1.	All

Serial No.	Safety Requirement Description	Subsystem
SR-24	Cables shall be of low smoke emission type according to IEC 61034.	All
SR-25	Equipment mounting shall not obstruct the movement of staff or passengers during emergency. Passenger shall alight from vehicles to station platform on walkways and track bed in this case. All track mounted equipment and cables shall be fitted with ramps and covers for this purpose to protect passengers and equipment.	All
SR-26	Openings in walls and floors shall be sealed after the cable installation with a fireproof barrier, so that the original fireproof quality of the wall or floor is restored.	All
SR-27	Equipment, cables, drainage and other pipes, and all other materials shall be non-combustible and halogen-free when subject to heat or fire.	All
SR-28	Emergency traction power tripping is assessed as an on-demand safety function, the acceptable wrong side failure rate sets a requirement equivalent in accordance to applicable standards	Power
SR-29	All conductive parts liable to become live from the voltage of the contact line under fault condition shall be directly connected to the traction system earth.	Power
SR-30	The emergency power system shall have a capacity and rating in accordance to IEC or EN or NFPA 130 or any applicable standards sufficient to supply all equipment required to be connected.	Power
SR-31	Provide the emergency power (UPS) for the emergency lighting Means of egress in the stations or tunnels in accordance with section 7.9 of NFPA 101 with minimum of 1.5 hours in the event of failure of normal lighting.	Power
SR-32	The power supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.	Power
SR-33	All wiring materials and installations within trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of NFPA 130 6.3.3.2.2 through 6.3.3.2.9.	Power
SR-34	Conductive parts which cannot be directly connected to the traction system earth shall be protected by a voltage-limiting device. Voltage-limiting devices shall be used to make an open connection from exposed conductive parts to the return circuit to allow the interruption of the current in a short time to limit the voltage given in EN 50122.	Power
SR-35	The power supply for the PSD shall be provided with uninterrupted power supply system (UPS) to allow at least 5 cycle operation and 2 hours for monitoring.	Power, PSD
SR-36	The system shall comply with the EMC requirements in accordance with relevant standards.	All

Serial No.	Safety Requirement Description	Subsystem
SR-37	In general, routing of any kind of cables through smoke extraction paths shall not be allowed unless appropriate cable protection measures have been taken.	All
SR-38	Ensure no high inflammable material is used on guideway and surrounding area.	All
SR-39	Where equipment with potential ignition sources, e.g. an arc, is installed within confined areas, the Contractor shall ensure that the equipment is stored in such a configuration that it is not possible to attain a critical mass from combustible materials.	All
SR-40	The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.	All
SR-41	AFC Gates shall be in accordance with NFPA 130 requirements 5.5.3.1 and 5.5.3.2, being designed so that their failure to operate will not prohibit movement of passengers in the direction of emergency egress.	AFC
SR-42	The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.	DEP
SR-43	Wires and cables smoke release tests and certification according to IEC 61034 for smoke density and IEC 60754 for toxicity shall be permitted.	DEP
SR-44	All Depot Equipment shall be designed to fail to a safe condition. Any failure of the equipment shall not cause any further mechanical damage or serious consequences.	DEP, Power
SR-45	Based on BS EN 62305 a lightning risks assessment evaluation shall be carried out to assist in the analysis of various criteria to determine the risk level of loss due lightning strike, risk assessment calculations to be performed by the contractor in order to define the required lightning protection level.	MEP
SR-46	At the surface when measured at the nearest property line of a residence, commercial building or industrial building, the noise level shall meet local ordinances criteria.	MEP
SR-47	While Train on fire stops in tunnel, a fire alarm to be communicated to OCC either through passenger alarm or through vehicle automatic fire detection system.	OCC, RS, TEL
SR-48	To ensure Synchronized opening of PSD with train door	PSD
SR-49	The design of hardware and software of PSD shall be at least SIL 2 in accordance with IEC 61508 and IEC 62279.	PSD
SR-50	All ASDs shall open/close after PSD received OPEN/CLOSE command from Signaling.	PSD
SR-51	ASD is equipped with obstacle detection device. The device will temporarily release the closing and automatic re-open when the door is obstructed.	PSD

Serial No.	Safety Requirement Description	Subsystem
SR-52	Audible sound as well as door indicating lights to be activated when the doors starts closing.	PSD
SR-53	Inscriptions and pictograms will be used to alert the passenger not to lean against ASDs.	PSD
SR-54	Platform end doors equipped with emergency manual release mechanism on trackside to be located at both of the platform ends to allow evacuation from trackside into the platform area.	PSD
SR-55	Control of platform screen doors shall be possible from the LCPD (Local Control Panel for Driver) by the driver on the trackside and from LCPS (Local Control Panel for Station staff) by the station staff on the platform side.	PSD
SR-56	PSD shall be provided with the required insulation when passenger in contact with the PSD.	PSD
SR-57	Door control and operating arrangements shall be fail safe design.	PSD
SR-58	The entire construction and glazing of the PSD System shall withstand the pressure from non-stop train and the wind pressure from tropical storm.	PSD
SR-59	Platform Screen Doors shall be fabricated with non-combustible materials.	PSD
SR-60	The closing force of the ASD is no more than 150N per door leaf. The maximum kinetic energy of the ASD is no more than 10J per door leaf. The target of open time is 2.5s to 3.0s and close time is 3.0s to 3.5s, however performance will be depended on final door weight and subject to compliance with specified impact force and kinetic energy constraints.	PSD
SR-61	The platform face of the screen and screen doors shall not have any footrest or handhold.	PSD
SR-62	A manual release latch shall be provided on the Automated Sliding Doors (ASD) to permit passengers to manually open the doors from the train side in an emergency situation.	PSD
SR-63	PSD shall be earthed to the station earth but all exposed surface shall be insulated to protect from electric shock.	PSD, RS, TRK, CIV
SR-64	PSD should be positioned as close as feasible to train body to prevent a person or child being trapped between a vehicle and the doors when the doors are closed. If the PSD cannot be located closed to the platform edge, a passenger detection system to detect any passenger trapped between the PSD and train shall be used. The presence of a person between the PSD and train shall prohibit the train from leaving the platform.	PSD, RS
SR-65	Trains shall not be allowed to enter the station until the signaling system receives an ‘ALL DOORS CLOSED’ signal from the PSD System. It shall only be possible to start the train under normal conditions when all train doors and PSD doors are	PSD, SIG

Serial No.	Safety Requirement Description	Subsystem
	closed.	
SR-66	When “All Doors Closed and Locked” output provide from PSD to Signaling is not confirmed and for there are some operation reasons, operator can use LCPD at trackside or LCPS at platform side to provide an “Interlock Override” to act as pseudo "All Door Closed and Locked" signal.	PSD, SIG
SR-67	All alarms and status through BMS (Building management system) shall be connected to OCC and through the optic fiber backbone provided by Telecom system.	PSD, MEP
SR-68	The entire RST structure, including any associated attachments, shall be free from sharp edges, weld spatter and swarf so as not to present hazards to passengers, operators, maintenance personnel and equipment used for maintenance or cleaning.	RS
SR-69	RS to have Obstacle Detection / Derailment System (ODDS) safety functions in their design	RS
SR-70	Emergency braking function to be a fail-safe design	RS
SR-71	RS shall provide physical separation of on-board electrical cubicles and enclosures for the general public, passengers, non-electrical workers and maintenance staff from any potential electrical hazards.	RS
SR-72	The production of any gas or concentration of gas from the batteries shall not at any time constitute a safety hazard. The enclosure shall be designed to prevent dust, sand or extraneous material settling on top of the battery.	RS
SR-73	No single defect or failure of any part of any train door system shall produce a situation capable of causing injury to any train door user.	RS
SR-74	No spurious electrical signals shall cause any train door to be released or opened unintentionally.	RS
SR-75	Electric shock/electrocution for passengers and staff during boarding/alighting of train shall be avoided. Touch voltage values shall be below the limits stated in IEC 62128-1, EN 50122-1 and IEC 60364-4-41.	RS
SR-76	The parking brakes, when applied, shall hold a stationary train in the AW4 loading condition indefinitely on the worst gradient (i.e. 4%) of the network in the worst operational conditions (i.e. AW4).	RS
SR-77	Emergency release levers (push bars) are located on all doors, so another door can be used for egress.	RS
SR-78	Design of vehicle (RS) to meet specified requirements for fire safety, including flammability and smoke emission characteristics.	RS
SR-79	Traction interlock due to door open status will prevent application of traction power.	RS

Serial No.	Safety Requirement Description	Subsystem
SR-80	TCMS (Train control management system) monitors the status of the Train Radio system, with alarm to train driver.	RS
SR-81	Train headlights & tail lights are provided for poor visibility / night conditions.	RS
SR-82	All circuits with the exception of the main traction circuits shall be protected by circuit breakers.	RS
SR-83	The Emergency Brake Circuit is a service proven design with a four-wire, double-break trainline following the active circuit principle. The EB Circuit is comprised of low complexity hardware.	RS
SR-84	Obstacle detection system on the train doors, with doors re-opening if obstacle is detected.	RS
SR-85	The system shall incorporate a walk surface/walkway or other approved means for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety.	CIV, SYS
SR-86	Anti-clamber device at platform edge to be provided which will help prevent passengers from standing in the gap between the PSD and the train.	PSD, RS
SR-87	When the emergency door release handle in train is operated, the activated information shall be sent to OCC via SIG.	RS SIG
SR-88	When an obstacle is detected or the leading wheel set of the train derails, the emergency brakes shall be applied and an alarm sent to the OCC.	RS, SIG
SR-89	No High Voltage equipment is located where passengers can contact.	RS, PSD, SIG, AFC, PSD, SIG, TEL
SR-90	Emergency Brake will be automatically initiated by SIG in case of loss of train integrity.	RS, SIG
SR-91	When train on fire stops in tunnel or station fire alarm will be activated for platform and station evacuation.	SCADA, MEP
SR-92	The escape way shall be free of any obstruction above the walking surface over minimum clearance areas as specified in NFPA 130, clause 6.3.2.1.	SCADA, TEL
SR-93	Interlocking shall be designed to ensure that a single failure shall not cause an uncontrolled hazardous situation.	SIG
SR-94	It shall be possible to safely prevent the automatic start of a train at any stabling or stop position while staff are approaching or entering the train.	RS
SR-95	The system shall include signage throughout the network to provide assistance, direction and warning to passengers and operations personnel to support normal, degraded and emergency operations. Signage shall include the following types:	SYS, CIV

Serial No.	Safety Requirement Description	Subsystem
	<ul style="list-style-type: none"> · Way finding signage: · System identification signs · Station name signs · Directional signs · Travel information displays · Metro network map · Local area map · Descriptive signs · Emergency exit signs · Trackside and tunnel signage · Other facility way finding signage · Warning, mandatory and prohibition signs <p>Signage may also be complimented by the use of the passenger information and public address systems.</p>	
SR-96	The fire detection and alarm system Manual call points for outdoor mounting shall have IP-65 enclosure protection and in explosion hazardous areas shall have explosion proof protection.	MEP, TEL
SR-97	Automatic fire detection shall be provided along the tunnel trainway and inside technical rooms located within tunnel sections.	MEP, TEL
SR-98	“Cant” and "gradient Cant" will be applied to curve and transition curve.	TRK
SR-99	Gauges and Clearances shall be in alignment with RS cross-section and kinematic envelope.	TRK
SR-100	Track structure shall be capable to contain the train path in the event of derailment (<i>Containment from tilting, running into the structure gauge of the opposite track and from colliding with bridge/tunnel equipment</i>).	TRK
SR-101	Buffer stops shall be capable for the rolling stock weight to stop without major damage.	TRK
SR-102	The desirable minimum main TD 'track distance' (<i>distance between two track distance center lines</i>) shall be 4.00 m for higher operational speeds >100 km/h.	TRK, CIV
SR-103	To provide control and monitoring of Tunnel Ventilation system (TVS) during fire situation to ensure tenable environment conditions can be maintained.	MEP
SR-104	Provide necessary smoke control to achieve tenable conditions for passenger evacuation during emergency (fire) conditions in the tunnels, trackways and stations as per NFPA 130 specification or an equivalent international standard requirement. Cross-passageways shall also remain free of smoke during a tunnel fire incident.	MEP, CIV, SYS
SR-105	The Power SCADA (Safety Functions) shall be SIL 2	Power
SR-106	The ETCS Level 2 system shall always prevent train movement outside of the safe operating envelope by application of the service brake.	SIG

Serial No.	Safety Requirement Description	Subsystem
SR-107	The ERTMS / ETCS System shall ensure that the train shall be brought under control and not overrun the end of track buffers even under the worst failure conditions.	SIG
SR-108	Metrological and Seismic Monitoring System shall be provided for prevention of possible damage suffered from designated natural disaster to the railway facilities and safety of passengers	TEL
SR-109	Flooding detection and protection system shall be provided.	TEL
SR-110	Water leak detection and water level in the tanks shall be monitored by BMS in stations, tunnels, depot (wherever applicable).	MEP, TEL
SR-111	Fire detection and suppression system in OCC	MEP, TEL
SR-112	Emergency power supply system shall be provided in the stations, Tunnel, OCC	MEP, Power
SR-113	Adequate safety integrity level shall be ensured for switchover function of signaling systems between ETCS and CBTC at Bicutan station.	SIG
SR-114	Provision of emergency lighting system in the tunnel for emergency evacuation.	MEP
SR-115	Fire and smoke detection function shall be ensured in tunnel and in train and it shall be reported to the Operator as alarm for the appropriate course of action.	MEP
SR-116	Tunnels shall be equipped with fire suppression systems for the emergency services. These shall comply with the relevant codes of practice/standards.	MEP
SR-117	Provision of smoke extraction system in stations, Tunnel, Depots (wherever applicable).	MEP
SR-118	Adequate insulation, earthing and bonding of all MEP and E&M Systems equipment as per relevant standards.	SYS, MEP
SR-119	Substation buildings within the TSS premises shall have fire resistant barriers, flame, heat and smoke detection, and automatic gas suppression systems.	Power, MEP
SR-120	Electronic Access Control system shall be provided in important rooms each station, each substation and each depot.	TEL, MEP
SR-121	Object detection system shall be provided in PSD and Train door system to detect intrusion of trespassers between PSD and Train	RS, PSD
SR-122	Grounding and bonding provision to connect between track slab and viaduct superstructure/Walkway/OCS Pole.	TWK, SYS
SR-123	The firefighting equipment shall be controlled directly from the fire alarm control panel	MEP
SR-124	The PA (Passenger Announcement) system shall comply to NFPA 72 and NFPA	TEL

Serial No.	Safety Requirement Description	Subsystem
	130	

Note: The above safety requirements listed in the table are minimum and Contractor shall elaborate the list based on their analysis.

Appendix B Generic Safety Requirements

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
SR-01	The ETCS System shall monitor the time elapsed from one platform up to the next platform, for a train passing through a tunnel section. In case the time elapsed is larger than a threshold (to be agreed with the Engineer in further design stage), an alarm shall be triggered in the OCC.	SIG
SR-02	The ETCS System shall apply Emergency Brakes for a moving train, if an unauthorized mode is selected.	SIG
SR-03	In Off mode, the ETCS System shall command 100% braking effort, and shall command Emergency Brakes if movement is detected.	SIG
SR-04	Failure of fallback signals shall not result in degradation of ETCS normal operation.	SIG
SR-05	In case of a signaling system failure, a driver shall be able to drive the train at low speed without full ATP protection.	SIG
SR-06	The ETCS system shall ensure the safe metro operation of all rail vehicle movements on all tracks.	SIG
SR-07	The System shall prevent a controlled train from travelling in the opposite direction of its Movement Authority.	SIG
SR-08	The ETCS System shall ensure the train stops safely before a buffer (end of guideway).	SIG
SR-09	In the event of a single brake system failure, the guaranteed minimum emergency brake rate shall not be less than 1.04m/s ² . to ensure safe train separation is maintained.	SIG
SR-10	The ATP equipment shall be of "fail-safe design" with high availability and designed in accordance with SIL 4 requirements as stipulated in standards indicated in the applicable specifications	SIG
SR-11	The ETCS System shall apply the train Emergency Brake when it detects movement in the opposite authorized direction of travel for which the cumulative distance is greater than the maximum rollback tolerance distance.	SIG
SR-12	The ETCS System shall prevent train movement of controlled trains inside a traction power off area.	SIG
SR-13	The ETCS System shall ensure that a train does not depart a station until the "Closed and Locked" Status indicates all doors are closed and locked.	SIG
SR-14	When stopping at a platform, the ETCS System shall ensure that train doors on the opposite (non-opening) side of the train remain "Closed and Latched".	SIG
SR-15	The train shall stop within ±300 mm limits in order to enable automatic opening of ASDs (Automatic Sliding Door) through interfacing signals with the signaling	SIG

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
	<u>system.</u>	
SR-16	<u>The ETCS System shall prevent approaching trains from entering the power section occupied by the incident train.</u>	SIG
SR-17	<u>All ATP functions shall be vital functions and shall be designed and implemented in accordance with relevant standards. The Safety Integrity Level (SIL) shall be as follows:</u> <u>- ATP: SIL4</u> <u>- CBI: SIL4</u> <u>- Train Detection system: SIL4</u> <u>- Radio Block Center (RBC): SIL4</u> <u>- ATS (Signaling Supervision): SIL2</u> <u>- Signaling False Starting Protection: SIL4</u> <u>- Signaling Train Over Run Protection: SIL 4</u> <u>- Signaling Speed Restriction: SIL 4</u> <u>- Power SCADA (Safety Functions): SIL 2</u> <u>- ATP on-board equipment: SIL4.</u> <u>-PSD system: SIL 2</u> <u>-PSD interface with Signaling (Vital Signals): SIL 4.</u>	SIG, TEL
SR-18	<u>The signals shall be installed at the trackside at breaking distance and visible to the Driver's eye view level</u>	SIG
SR-19	<u>Train washing mode shall be automatically selected before trains pass through the washing plant. The speed shall be controlled at a low safe speed and avoid sudden accelerations.</u>	SIG, RS
SR-20	<u>The train shall not be able to move if one or more doors are not closed and locked. In case a door is unable to close or lock, it is possible to manually close and isolate it, so that the train can be withdrawn from service in Automatic Mode. In emergency cases passengers shall be able to open the door system from inside or outside of the train.</u>	SIG, RS
SR-21	<u>All buffer stops shall be positioned such that the required braking length can be safely achieved.</u>	SIG, TRK
SR-22	<u>Cables shall be fire retardant as a minimum according to IEC 60332-3.</u>	All
SR-23	<u>Cables shall be of zero halogen type according to IEC 60754-1.</u>	All

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
SR-24	<u>Cables shall be of low smoke emission type according to IEC 61034.</u>	<u>All</u>
SR-25	<u>Equipment mounting shall not obstruct the movement of staff or passengers during emergency. Passenger shall alight from vehicles to station platform on walkways and track bed in this case. All track mounted equipment and cables shall be fitted with ramps and covers for this purpose to protect passengers and equipment.</u>	<u>All</u>
SR-26	<u>Openings in walls and floors shall be sealed after the cable installation with a fireproof barrier, so that the original fireproof quality of the wall or floor is restored.</u>	<u>All</u>
SR-27	<u>Equipment, cables, drainage and other pipes, and all other materials shall be non-combustible and halogen-free when subject to heat or fire.</u>	<u>All</u>
SR-28	<u>Emergency traction power tripping is assessed as an on-demand safety function, the acceptable wrong side failure rate sets a requirement equivalent in accordance to applicable standards</u>	<u>Power</u>
SR-29	<u>All conductive parts liable to become live from the voltage of the contact line under fault condition shall be directly connected to the traction system earth.</u>	<u>Power</u>
SR-30	<u>The emergency power system shall have a capacity and rating in accordance to IEC or EN or NFPA 130 or any applicable standards sufficient to supply all equipment required to be connected.</u>	<u>Power</u>
SR-31	<u>Provide the emergency power (UPS) for the emergency lighting Means of egress in the stations or tunnels in accordance with section 7.9 of NFPA 101 with minimum of 1.5 hours in the event of failure of normal lighting.</u>	<u>Power</u>
SR-32	<u>The power supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.</u>	<u>Power</u>
SR-33	<u>All wiring materials and installations within trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of NFPA 130 6.3.3.2.2 through 6.3.3.2.9.</u>	<u>Power</u>
SR-34	<u>Conductive parts which cannot be directly connected to the traction system earth shall be protected by a voltage-limiting device. Voltage-limiting devices shall be used to make an open connection from exposed conductive parts to the return circuit to allow the interruption of the current in a short time to limit the voltage given in EN 50122.</u>	<u>Power</u>
SR-35	<u>The power supply for the PSD shall be provided with uninterrupted power supply system (UPS) to allow at least 5 cycle operation and 2 hours for monitoring.</u>	<u>Power, PSD</u>
SR-36	<u>The system shall comply with the EMC requirements in accordance with relevant standards.</u>	<u>All</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
SR-37	<u>In general, routing of any kind of cables through smoke extraction paths shall not be allowed unless appropriate cable protection measures have been taken.</u>	<u>All</u>
SR-38	<u>Ensure no high inflammable material is used on guideway and surrounding area.</u>	<u>All</u>
SR-39	<u>Where equipment with potential ignition sources, e.g. an arc, is installed within confined areas, the Contractor shall ensure that the equipment is stored in such a configuration that it is not possible to attain a critical mass from combustible materials.</u>	<u>All</u>
SR-40	<u>The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.</u>	<u>All</u>
SR-41	<u>AFC Gates shall be in accordance with NFPA 130 requirements 5.5.3.1 and 5.5.3.2, being designed so that their failure to operate will not prohibit movement of passengers in the direction of emergency egress.</u>	<u>AFC</u>
SR-42	<u>The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.</u>	<u>DEP</u>
SR-43	<u>Wires and cables smoke release tests and certification according to IEC 61034 for smoke density and IEC 60754 for toxicity shall be permitted.</u>	<u>DEP</u>
SR-44	<u>All Depot Equipment shall be designed to fail to a safe condition. Any failure of the equipment shall not cause any further mechanical damage or serious consequences.</u>	<u>DEP, Power</u>
SR-45	<u>Based on BS EN 62305 a lightning risks assessment evaluation shall be carried out to assist in the analysis of various criteria to determine the risk level of loss due lightning strike, risk assessment calculations to be performed by the contractor in order to define the required lightning protection level.</u>	<u>MEP</u>
SR-46	<u>At the surface when measured at the nearest property line of a residence, commercial building or industrial building, the noise level shall meet local ordinances criteria.</u>	<u>MEP</u>
SR-47	<u>While Train on fire stops in tunnel, a fire alarm to be communicated to OCC either through passenger alarm or through vehicle automatic fire detection system.</u>	<u>OCC, RS, TEL</u>
SR-48	<u>To ensure Synchronized opening of PSD with train door</u>	<u>PSD</u>
SR-49	<u>The design of hardware and software of PSD shall be at least SIL 2 in accordance with IEC 61508 and IEC 62279.</u>	<u>PSD</u>
SR-50	<u>All ASDs shall open/close after PSD received OPEN/CLOSE command from Signaling.</u>	<u>PSD</u>
SR-51	<u>ASD is equipped with obstacle detection device. The device will temporarily release the closing and automatic re-open when the door is obstructed.</u>	<u>PSD</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
<u>SR-52</u>	<u>Audible sound as well as door indicating lights to be activated when the doors starts closing.</u>	<u>PSD</u>
<u>SR-53</u>	<u>Inscriptions and pictograms will be used to alert the passenger not to lean against ASDs.</u>	<u>PSD</u>
<u>SR-54</u>	<u>Platform end doors equipped with emergency manual release mechanism on trackside to be located at both of the platform ends to allow evacuation from trackside into the platform area.</u>	<u>PSD</u>
<u>SR-55</u>	<u>Control of platform screen doors shall be possible from the LCPD (Local Control Panel for Driver) by the driver on the trackside and from LCPS (Local Control Panel for Station staff) by the station staff on the platform side.</u>	<u>PSD</u>
<u>SR-56</u>	<u>PSD shall be provided with the required insulation when passenger in contact with the PSD.</u>	<u>PSD</u>
<u>SR-57</u>	<u>Door control and operating arrangements shall be fail safe design.</u>	<u>PSD</u>
<u>SR-58</u>	<u>The entire construction and glazing of the PSD System shall withstand the pressure from non-stop train and the wind pressure from tropical storm.</u>	<u>PSD</u>
<u>SR-59</u>	<u>Platform Screen Doors shall be fabricated with non-combustible materials.</u>	<u>PSD</u>
<u>SR-60</u>	<u>The closing force of the ASD is no more than 150N per door leaf. The maximum kinetic energy of the ASD is no more than 10J per door leaf. The target of open time is 2.5s to 3.0s and close time is 3.0s to 3.5s, however performance will be depended on final door weight and subject to compliance with specified impact force and kinetic energy constraints.</u>	<u>PSD</u>
<u>SR-61</u>	<u>The platform face of the screen and screen doors shall not have any footrest or handhold.</u>	<u>PSD</u>
<u>SR-62</u>	<u>A manual release latch shall be provided on the Automated Sliding Doors (ASD) to permit passengers to manually open the doors from the train side in an emergency situation.</u>	<u>PSD</u>
<u>SR-63</u>	<u>PSD shall be earthed to the station earth but all exposed surface shall be insulated to protect from electric shock.</u>	<u>PSD, RS, TRK, CIV</u>
<u>SR-64</u>	<u>PSD should be positioned as close as feasible to train body to prevent a person or child being trapped between a vehicle and the doors when the doors are closed. If the PSD cannot be located closed to the platform edge, a passenger detection system to detect any passenger trapped between the PSD and train shall be used. The presence of a person between the PSD and train shall prohibit the train from leaving the platform.</u>	<u>PSD, RS</u>
<u>SR-65</u>	<u>Trains shall not be allowed to enter the station until the signaling system receives an ‘ALL DOORS CLOSED’ signal from the PSD System. It shall only be possible to start the train under normal conditions when all train doors and PSD doors are</u>	<u>PSD, SIG</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
	closed.	
SR-66	<u>When “All Doors Closed and Locked” output provide from PSD to Signaling is not confirmed and for there are some operation reasons, operator can use LCPD at trackside or LCPS at platform side to provide an “Interlock Override” to act as pseudo "All Door Closed and Locked" signal.</u>	<u>PSD, SIG</u>
SR-67	<u>All alarms and status through BMS (Building management system) shall be connected to OCC and through the optic fiber backbone provided by Telecom system.</u>	<u>PSD, MEP</u>
SR-68	<u>The entire RST structure, including any associated attachments, shall be free from sharp edges, weld spatter and swarf so as not to present hazards to passengers, operators, maintenance personnel and equipment used for maintenance or cleaning.</u>	<u>RS</u>
SR-69	<u>RS to have Obstacle Detection / Derailment System (ODDS) safety functions in their design</u>	<u>RS</u>
SR-70	<u>Emergency braking function to be a fail-safe design</u>	<u>RS</u>
SR-71	<u>RS shall provide physical separation of on-board electrical cubicles and enclosures for the general public, passengers, non-electrical workers and maintenance staff from any potential electrical hazards.</u>	<u>RS</u>
SR-72	<u>The production of any gas or concentration of gas from the batteries shall not at any time constitute a safety hazard. The enclosure shall be designed to prevent dust, sand or extraneous material settling on top of the battery.</u>	<u>RS</u>
SR-73	<u>No single defect or failure of any part of any train door system shall produce a situation capable of causing injury to any train door user.</u>	<u>RS</u>
SR-74	<u>No spurious electrical signals shall cause any train door to be released or opened unintentionally.</u>	<u>RS</u>
SR-75	<u>Electric shock/electrocution for passengers and staff during boarding/alighting of train shall be avoided. Touch voltage values shall be below the limits stated in IEC 62128-1, EN 50122-1 and IEC 60364-4-41.</u>	<u>RS</u>
SR-76	<u>The parking brakes, when applied, shall hold a stationary train in the AW4 loading condition indefinitely on the worst gradient (i.e. 4%) of the network in the worst operational conditions (i.e. AW4).</u>	<u>RS</u>
SR-77	<u>Emergency release levers (push bars) are located on all doors, so another door can be used for egress.</u>	<u>RS</u>
SR-78	<u>Design of vehicle (RS) to meet specified requirements for fire safety, including flammability and smoke emission characteristics.</u>	<u>RS</u>
SR-79	<u>Traction interlock due to door open status will prevent application of traction power.</u>	<u>RS</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
<u>SR-80</u>	<u>TCMS (Train control management system) monitors the status of the Train Radio system, with alarm to train driver.</u>	<u>RS</u>
<u>SR-81</u>	<u>Train headlights & tail lights are provided for poor visibility / night conditions.</u>	<u>RS</u>
<u>SR-82</u>	<u>All circuits with the exception of the main traction circuits shall be protected by circuit breakers.</u>	<u>RS</u>
<u>SR-83</u>	<u>The Emergency Brake Circuit is a service proven design with a four-wire, double-break trainline following the active circuit principle. The EB Circuit is comprised of low complexity hardware.</u>	<u>RS</u>
<u>SR-84</u>	<u>Obstacle detection system on the train doors, with doors re-opening if obstacle is detected.</u>	<u>RS</u>
<u>SR-85</u>	<u>The system shall incorporate a walk surface/walkway or other approved means for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety.</u>	<u>CIV, SYS</u>
<u>SR-86</u>	<u>Anti-clamber device at platform edge to be provided which will help prevent passengers from standing in the gap between the PSD and the train.</u>	<u>PSD, RS</u>
<u>SR-87</u>	<u>When the emergency door release handle in train is operated, the activated information shall be sent to OCC via SIG.</u>	<u>RS SIG</u>
<u>SR-88</u>	<u>When an obstacle is detected or the leading wheel set of the train derails, the emergency brakes shall be applied and an alarm sent to the OCC.</u>	<u>RS, SIG</u>
<u>SR-89</u>	<u>No High Voltage equipment is located where passengers can contact.</u>	<u>RS, PSD, SIG, AFC, PSD, SIG, TEL</u>
<u>SR-90</u>	<u>Emergency Brake will be automatically initiated by SIG in case of loss of train integrity.</u>	<u>RS, SIG</u>
<u>SR-91</u>	<u>When train on fire stops in tunnel or station fire alarm will be activated for platform and station evacuation.</u>	<u>SCADA, MEP</u>
<u>SR-92</u>	<u>The escape way shall be free of any obstruction above the walking surface over minimum clearance areas as specified in NFPA 130, clause 6.3.2.1.</u>	<u>SCADA, TEL</u>
<u>SR-93</u>	<u>Interlocking shall be designed to ensure that a single failure shall not cause an uncontrolled hazardous situation.</u>	<u>SIG</u>
<u>SR-94</u>	<u>It shall be possible to safely prevent the automatic start of a train at any stabling or stop position while staff are approaching or entering the train.</u>	<u>RS</u>
<u>SR-95</u>	<u>The system shall include signage throughout the network to provide assistance, direction and warning to passengers and operations personnel to support normal, degraded and emergency operations. Signage shall include the following types:</u>	<u>SYS, CIV</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
	<ul style="list-style-type: none"> · <u>Way finding signage:</u> · <u>System identification signs</u> · <u>Station name signs</u> · <u>Directional signs</u> · <u>Travel information displays</u> · <u>Metro network map</u> · <u>Local area map</u> · <u>Descriptive signs</u> · <u>Emergency exit signs</u> · <u>Trackside and tunnel signage</u> · <u>Other facility way finding signage</u> · <u>Warning, mandatory and prohibition signs</u> <p><u>Signage may also be complimented by the use of the passenger information and public address systems.</u></p>	
SR-96	<u>The fire detection and alarm system Manual call points for outdoor mounting shall have IP-65 enclosure protection and in explosion hazardous areas shall have explosion proof protection.</u>	MEP, TEL
SR-97	<u>Automatic fire detection shall be provided along the tunnel trainway and inside technical rooms located within tunnel sections.</u>	MEP, TEL
SR-98	<u>“Cant” and "gradient Cant" will be applied to curve and transition curve.</u>	TRK
SR-99	<u>Gauges and Clearances shall be in alignment with RS cross-section and kinematic envelope.</u>	TRK
SR-100	<u>Track structure shall be capable to contain the train path in the event of derailment (Containment from tilting, running into the structure gauge of the opposite track and from colliding with bridge/tunnel equipment).</u>	TRK
SR-101	<u>Buffer stops shall be capable for the rolling stock weight to stop without major damage.</u>	TRK
SR-102	<u>The desirable minimum main TD 'track distance' (distance between two track distance center lines) shall be 4.00 m for higher operational speeds >100 km/h.</u>	TRK, CIV
SR-103	<u>To provide control and monitoring of Tunnel Ventilation system (TVS) during fire situation to ensure tenable environment conditions can be maintained.</u>	MEP
SR-104	<u>Provide necessary smoke control to achieve tenable conditions for passenger evacuation during emergency (fire) conditions in the tunnels, trackways and stations as per NFPA 130 specification or an equivalent international standard requirement. Cross-passageways shall also remain free of smoke during a tunnel fire incident.</u>	MEP, CIV, SYS
SR-105	<u>The Power SCADA (Safety Functions) shall be SIL 2</u>	Power
SR-106	<u>The ETCS Level 2 system shall always prevent train movement outside of the safe operating envelope by application of the service brake.</u>	SIG

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
SR-107	<u>The ERTMS / ETCS System shall ensure that the train shall be brought under control and not overrun the end of track buffers even under the worst failure conditions.</u>	<u>SIG</u>
SR-108	<u>Metrological and Seismic Monitoring System shall be provided for prevention of possible damage suffered from designated natural disaster to the railway facilities and safety of passengers</u>	<u>TEL</u>
SR-109	<u>Flooding detection and protection system shall be provided.</u>	<u>TEL</u>
SR-110	<u>Water leak detection and water level in the tanks shall be monitored by BMS in stations, tunnels, depot (wherever applicable).</u>	<u>MEP, TEL</u>
SR-111	<u>Fire detection and suppression system in OCC</u>	<u>MEP, TEL</u>
SR-112	<u>Emergency power supply system shall be provided in the stations, Tunnel, OCC</u>	<u>MEP, Power</u>
SR-113	<u>Adequate safety integrity level shall be ensured for switchover function of signaling systems between ETCS and CBTC at Bicutan station.</u>	<u>SIG</u>
SR-114	<u>Provision of emergency lighting system in the tunnel for emergency evacuation.</u>	<u>MEP</u>
SR-115	<u>Fire and smoke detection function shall be ensured in tunnel and in train and it shall be reported to the Operator as alarm for the appropriate course of action.</u>	<u>MEP</u>
SR-116	<u>Tunnels shall be equipped with fire suppression systems for the emergency services. These shall comply with the relevant codes of practice/standards.</u>	<u>MEP</u>
SR-117	<u>Provision of smoke extraction system in stations, Tunnel, Depots (wherever applicable).</u>	<u>MEP</u>
SR-118	<u>Adequate insulation, earthing and bonding of all MEP and E&M Systems equipment as per relevant standards.</u>	<u>SYS, MEP</u>
SR-119	<u>Substation buildings within the TSS premises shall have fire resistant barriers, flame, heat and smoke detection, and automatic gas suppression systems.</u>	<u>Power, MEP</u>
SR-120	<u>Electronic Access Control system shall be provided in important rooms each station, each substation and each depot.</u>	<u>TEL, MEP</u>
SR-121	<u>Object detection system shall be provided in PSD and Train door system to detect intrusion of trespassers between PSD and Train</u>	<u>RS, PSD</u>
SR-122	<u>Grounding and bonding provision to connect between track slab and viaduct superstructure/Walkway/OCS Pole.</u>	<u>TWK, SYS</u>
SR-123	<u>The firefighting equipment shall be controlled directly from the fire alarm control panel</u>	<u>MEP</u>
SR-124	<u>The PA (Passenger Announcement) system shall comply to NFPA 72 and NFPA</u>	<u>TEL</u>

<u>Serial No.</u>	<u>Safety Requirement Description</u>	<u>Subsystem</u>
	<u>130</u>	

Serial No.	Safety Requirement Description	Subsystem
SR-01	The ETCS System shall monitor the time elapsed from one platform up to the next platform, for a train passing through a tunnel section. In case the time elapsed is larger than a threshold (to be agreed with the Engineer in further design stage), an alarm shall be triggered in the OCC.	SIG
SR-02	The ETCS System shall apply Emergency Brakes for a moving train, if an unauthorized mode is selected.	SIG
SR-03	In Off mode, the ETCS System shall command 100% braking effort, and shall command Emergency Brakes if movement is detected.	SIG
SR-04	Failure of fallback signals shall not result in degradation of ETCS normal operation.	SIG
SR-05	In case of a signaling system failure, a driver shall be able to drive the train at low speed without full ATP protection.	SIG
SR-06	The ETCS system shall ensure the safe metro operation of all rail vehicle movements on all tracks.	SIG
SR-07	The System shall prevent a controlled train from travelling in the opposite direction of its Movement Authority.	SIG
SR-08	The ETCS System shall ensure the train stops safely before a buffer (end of guideway).	SIG
SR-09	In the event of a single brake system failure, the guaranteed minimum emergency brake rate shall not be less than 1.04m/s², to ensure safe train separation is maintained.	SIG
SR-10	The ATP equipment shall be of "fail safe design" with high availability and designed in accordance with SIL 4 requirements as stipulated in standards indicated in the applicable specifications	SIG
SR-11	The ETCS System shall apply the train Emergency Brake when it detects movement in the opposite authorized direction of travel for which the cumulative distance is greater than the maximum rollback tolerance distance.	SIG
SR-12	The ETCS System shall prevent train movement of controlled trains inside a traction power off area.	SIG
SR-13	The ETCS System shall ensure that a train does not depart a station until the "Closed and Locked" Status indicates all doors are closed and locked.	SIG

Serial No.	Safety Requirement Description	Subsystem
SR-14	When stopping at a platform, the ETCS System shall ensure that train doors on the opposite (non-opening) side of the train remain "Closed and Latched".	SIG
SR-15	The train shall stop within ±300 mm limits in order to enable automatic opening of ASDs (Automatic Sliding Door) through interfacing signals with the signaling system.	SIG
SR-16	The ETCS System shall prevent approaching trains from entering the power-section occupied by the incident train.	SIG
SR-17	<p>All ATP functions shall be vital functions and shall be designed and implemented in accordance with relevant standards. The Safety Integrity Level (SIL) shall be as follows:</p> <ul style="list-style-type: none"> –ATP: SIL4 –CBI: SIL4 –Train Detection system: SIL4 –Radio Block Center (RBC): SIL4 –ATS (Signaling Supervision): SIL2 –Signaling False Starting Protection: SIL4 –Signaling Train Over Run Protection: SIL4 –Signaling Speed Restriction: SIL4 –Power SCADA (Safety Functions): SIL2 –ATP on-board equipment: SIL4 –PSD system: SIL2 –PSD interface with Signaling (Vital Signals): SIL4 	SIG, TEL
SR-18	The signals shall be installed at the trackside at breaking distance and visible to the Driver's eye view level.	SIG
SR-19	Train washing mode shall be automatically selected before trains pass through the washing plant. The speed shall be controlled at a low safe speed and avoid sudden accelerations.	SIG, RS
SR-20	The train shall not be able to move if one or more doors are not closed and locked. In case a door is unable to close or lock, it is possible to manually close and isolate it, so that the train can be withdrawn from service in Automatic Mode. In emergency cases passengers shall be able to open the door system from inside or outside of the train.	SIG, RS
SR-21	All buffer stops shall be positioned such that the required braking length can be safely achieved.	SIG, TRK

Serial No.	Safety Requirement Description	Subsystem
SR-22	Cables shall be fire retardant as a minimum according to IEC 60332-3.	All
SR-23	Cables shall be of zero halogen type according to IEC 60754-1.	All
SR-24	Cables shall be of low smoke emission type according to IEC 61034.	All
SR-25	Equipment mounting shall not obstruct the movement of staff or passengers during emergency. Passenger shall alight from vehicles to station platform on walkways and track bed in this case. All track mounted equipment and cables shall be fitted with ramps and covers for this purpose to protect passengers and equipment.	All
SR-26	Openings in walls and floors shall be sealed after the cable installation with a fireproof barrier, so that the original fireproof quality of the wall or floor is restored.	All
SR-27	Equipment, cables, drainage and other pipes, and all other materials shall be non-combustible and halogen free when subject to heat or fire.	All
SR-28	Emergency traction power tripping is assessed as an on-demand safety function, the acceptable wrong side failure rate sets a requirement equivalent in accordance to applicable standards	Power
SR-29	All conductive parts liable to become live from the voltage of the contact line under fault condition shall be directly connected to the traction system earth.	Power
SR-30	The emergency power system shall have a capacity and rating in accordance to IEC or EN or NFPA 130 or any applicable standards sufficient to supply all equipment required to be connected.	Power
SR-31	Provide the emergency power (UPS) for the emergency lighting Means of egress in the stations or tunnels in accordance with section 7.9 of NFPA 101 with minimum of 1.5 hours in the event of failure of normal lighting.	Power
SR-32	The power supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.	Power
SR-33	All wiring materials and installations within trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of NFPA 130 6.3.3.2.2 through 6.3.3.2.9.	Power
SR-34	Conductive parts which cannot be directly connected to the traction system earth shall be protected by a voltage limiting device. Voltage limiting devices shall be used to make an open connection from exposed conductive parts to the return circuit to allow the interruption of the current in a short time to limit the voltage given in EN 50122.	Power
SR-35	The power supply for the PSD shall be provided with uninterrupted power supply system (UPS) to allow at least 5 cycle operation and 2 hours for monitoring.	Power, PSD

Serial No.	Safety Requirement Description	Subsystem
SR-36	The system shall comply with the EMC requirements in accordance with relevant standards.	All
SR-37	In general, routing of any kind of cables through smoke extraction paths shall not be allowed unless appropriate cable protection measures have been taken.	All
SR-38	Ensure no high inflammable material is used on guideway and surrounding area.	All
SR-39	Where equipment with potential ignition sources, e.g. an arc, is installed within confined areas, the Contractor shall ensure that the equipment is stored in such a configuration that it is not possible to attain a critical mass from combustible materials.	All
SR-40	The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.	All
SR-41	AFC Gates shall be in accordance with NFPA 130 requirements 5.5.3.1 and 5.5.3.2, being designed so that their failure to operate will not prohibit movement of passengers in the direction of emergency egress.	AFC
SR-42	The Contractor shall isolate and protect safety critical cables and wires to minimize the impact on safety when there is a fire.	DEP
SR-43	Wires and cables smoke release tests and certification according to IEC 61034 for smoke density and IEC 60754 for toxicity shall be permitted.	DEP
SR-44	All Depot Equipment shall be designed to fail to a safe condition. Any failure of the equipment shall not cause any further mechanical damage or serious consequences.	DEP, Power
SR-45	Based on BS EN 62305 a lightning risks assessment evaluation shall be carried out to assist in the analysis of various criteria to determine the risk level of loss due lightning strike, risk assessment calculations to be performed by the contractor in order to define the required lightning protection level.	MEP
SR-46	At the surface when measured at the nearest property line of a residence, commercial building or industrial building, the noise level shall meet local ordinances criteria.	MEP
SR-47	While Train on fire stops in tunnel, a fire alarm to be communicated to OCC either through passenger alarm or through vehicle automatic fire detection system.	OCC, RS, TEL
SR-48	To ensure Synchronized opening of PSD with train door	PSD
SR-49	The design of hardware and software of PSD shall be at least SIL 2 in accordance with IEC 61508 and IEC 62279.	PSD
SR-50	All ASDs shall open/close after PSD received OPEN/CLOSE command from Signaling.	PSD

Serial No.	Safety Requirement Description	Subsystem
SR-51	ASD is equipped with obstacle detection device. The device will temporarily release the closing and automatic re-open when the door is obstructed.	PSD
SR-52	Audible sound as well as door indicating lights to be activated when the doors starts closing.	PSD
SR-53	Inscriptions and pictograms will be used to alert the passenger not to lean against ASDs.	PSD
SR-54	Platform end doors equipped with emergency manual release mechanism on trackside to be located at both of the platform ends to allow evacuation from trackside into the platform area.	PSD
SR-55	Control of platform screen doors shall be possible from the LCPD (Local Control Panel for Driver) by the driver on the trackside and from LCPS (Local Control Panel for Station staff) by the station staff on the platform side.	PSD
SR-56	PSD shall be provided with the required insulation when passenger in contact with the PSD.	PSD
SR-57	Door control and operating arrangements shall be fail safe design.	PSD
SR-58	The entire construction and glazing of the PSD System shall withstand the pressure from non-stop train and the wind pressure from tropical storm.	PSD
SR-59	Platform Screen Doors shall be fabricated with non-combustible materials.	PSD
SR-60	The closing force of the ASD is no more than 150N per door leaf. The maximum kinetic energy of the ASD is no more than 10J per door leaf. The target of open time is 2.5s to 3.0s and close time is 3.0s to 3.5s, however performance will be depended on final door weight and subject to compliance with specified impact force and kinetic energy constraints.	PSD
SR-61	The platform face of the screen and screen doors shall not have any footrest or handhold.	PSD
SR-62	A manual release latch shall be provided on the Automated Sliding Doors (ASD) to permit passengers to manually open the doors from the train side in an emergency situation.	PSD
SR-63	PSD shall be earthed to the station earth but all exposed surface shall be insulated to protect from electric shock.	PSD, RS, TRK, CIV
SR-64	PSD should be positioned as close as feasible to train body to prevent a person or child being trapped between a vehicle and the doors when the doors are closed. If the PSD cannot be located closed to the platform edge, a passenger detection system to detect any passenger trapped between the PSD and train shall be used. The presence of a person between the PSD and train shall prohibit the train from leaving the platform.	PSD, RS

Serial- No.	Safety Requirement Description	Subsystem
SR-65	Trains shall not be allowed to enter the station until the signaling system receives an ‘ALL DOORS CLOSED’ signal from the PSD System. It shall only be possible to start the train under normal conditions when all train doors and PSD doors are closed.	PSD, SIG
SR-66	When “All Doors Closed and Locked” output provide from PSD to Signaling is not confirmed and for there are some operation reasons, operator can use LCPD at trackside or LCPS at platform side to provide an “Interlock Override” to act as pseudo “All Door Closed and Locked” signal.	PSD, SIG
SR-67	All alarms and status through BMS (Building management system) shall be connected to OCC and through the optic fiber backbone provided by Telecom system.	PSD, MEP
SR-68	The entire RST structure, including any associated attachments, shall be free from sharp edges, weld spatter and swarf so as not to present hazards to passengers, operators, maintenance personnel and equipment used for maintenance or cleaning.	RS
SR-69	RS to have Obstacle Detection / Derailment System (ODDS) safety functions in their design	RS
SR-70	Emergency braking function to be a fail-safe design	RS
SR-71	RS shall provide physical separation of on-board electrical cubicles and enclosures for the general public, passengers, non-electrical workers and maintenance staff from any potential electrical hazards.	RS
SR-72	The production of any gas or concentration of gas from the batteries shall not at any time constitute a safety hazard. The enclosure shall be designed to prevent dust, sand or extraneous material settling on top of the battery.	RS
SR-73	No single defect or failure of any part of any train door system shall produce a situation capable of causing injury to any train door user.	RS
SR-74	No spurious electrical signals shall cause any train door to be released or opened unintentionally.	RS
SR-75	Electric shock/electrocution for passengers and staff during boarding/alighting of train shall be avoided. Touch voltage values shall be below the limits stated in IEC 62128-1, EN 50122-1 and IEC 60364-4-41.	RS
SR-76	The parking brakes, when applied, shall hold a stationary train in the AW4 loading condition indefinitely on the worst gradient (i.e. 4%) of the network in the worst operational conditions (i.e. AW4).	RS
SR-77	Emergency release levers (push bars) are located on all doors, so another door can be used for egress.	RS
SR-78	Design of vehicle (RS) to meet specified requirements for fire safety, including flammability and smoke emission characteristics.	RS

Serial No.	Safety Requirement Description	Subsystem
SR-79	Traction interlock due to door open status will prevent application of traction power.	RS
SR-80	TCMS (Train control management system) monitors the status of the Train Radio system, with alarm to train driver.	RS
SR-81	Train headlights & tail lights are provided for poor visibility / night conditions.	RS
SR-82	All circuits with the exception of the main traction circuits shall be protected by circuit breakers.	RS
SR-83	The Emergency Brake Circuit is a service proven design with a four-wire, double-break trainline following the active circuit principle. The EB Circuit is comprised of low complexity hardware.	RS
SR-84	Obstacle detection system on the train doors, with doors re-opening if obstacle is detected.	RS
SR-85	The system shall incorporate a walk surface/walkway or other approved means for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety.	CIV, SYS
SR-86	Anti-clamber device at platform edge to be provided which will help prevent passengers from standing in the gap between the PSD and the train.	PSD, RS
SR-87	When the emergency door release handle in train is operated, the activated information shall be sent to OCC via SIG.	RS SIG
SR-88	When an obstacle is detected or the leading wheel set of the train derails, the emergency brakes shall be applied and an alarm sent to the OCC.	RS, SIG
SR-89	No High Voltage equipment is located where passengers can contact.	RS, PSD, SIG, AFC, PSD, SIG, TEL
SR-90	Emergency Brake will be automatically initiated by SIG in case of loss of train integrity.	RS, SIG
SR-91	When train on fire stops in tunnel or station fire alarm will be activated for platform and station evacuation.	SCADA, MEP
SR-92	The escape way shall be free of any obstruction above the walking surface over minimum clearance areas as specified in NFPA 130, clause 6.3.2.1.	SCADA, TEL
SR-93	Interlocking shall be designed to ensure that a single failure shall not cause an uncontrolled hazardous situation.	SIG
SR-94	It shall be possible to safely prevent the automatic start of a train at any stabling or stop position while staff are approaching or entering the train.	RS

Serial No.	Safety Requirement Description	Subsystem
SR-95	<p>The system shall include signage throughout the network to provide assistance, direction and warning to passengers and operations personnel to support normal, degraded and emergency operations.</p> <p>Signage shall include the following types:</p> <ul style="list-style-type: none"> — Way finding signage; — System identification signs — Station name signs — Directional signs — Travel information displays — Metro network map — Local area map — Descriptive signs — Emergency exit signs — Trackside and tunnel signage — Other facility way finding signage — Warning, mandatory and prohibition signs <p>Signage may also be complimented by the use of the passenger information and public address systems.</p>	SYS, CIV
SR-96	<p>The fire detection and alarm system Manual call points for outdoor mounting shall have IP-65 enclosure protection and in explosion hazardous areas shall have explosion proof protection.</p>	MEP, TEL
SR-97	<p>Automatic fire detection shall be provided along the tunnel trainway and inside technical rooms located within tunnel sections.</p>	MEP, TEL
SR-98	<p>"Cant" and "gradient Cant" will be applied to curve and transition curve.</p>	TRK
SR-99	<p>Gauges and Clearances shall be in alignment with RS cross section and kinematic envelope.</p>	TRK
SR-100	<p>Track structure shall be capable to contain the train path in the event of derailment (Containment from tilting, running into the structure gauge of the opposite track and from colliding with bridge/tunnel equipment).</p>	TRK
SR-101	<p>Buffer stops shall be capable for the rolling stock weight to stop without major damage.</p>	TRK
SR-102	<p>The desirable minimum main TD 'track distance' (distance between two track distance center lines) shall be 4.00 m for higher operational speeds >100 km/h.</p>	TRK, CIV
SR-103	<p>To provide control and monitoring of Tunnel Ventilation system (TVS) during fire situation to ensure tenable environment conditions can be maintained.</p>	MEP
SR-104	<p>Provide necessary smoke control to achieve tenable conditions for passenger evacuation during emergency (fire) conditions in the tunnels, trackways and stations as per NFPA-130 specification or an equivalent international standard requirement. Cross-passageways shall also remain free of smoke during a tunnel fire incident.</p>	MEP, CIV, SYS
SR-105	<p>The Power SCADA (Safety Functions) shall be SIL 2</p>	Power

Serial No.	Safety Requirement Description	Subsystem
SR-106	The ETCS Level 2 system shall always prevent train movement outside of the safe operating envelope by application of the service brake.	SIG
SR-107	The ERTMS / ETCS System shall ensure that the train shall be brought under control and not overrun the end of track buffers even under the worst failure conditions.	SIG
SR-108	Metrological and Seismic Monitoring System shall be provided for prevention of possible damage suffered from designated natural disaster to the railway facilities and safety of passengers	TEL
SR-109	Flooding detection and protection system shall be provided.	TEL
SR-110	Water leak detection and water level in the tanks shall be monitored by BMS in stations, tunnels, depot (wherever applicable).	MEP, TEL
SR-111	Fire detection and suppression system in OCC	MEP, TEL
SR-112	Emergency power supply system shall be provided in the stations, Tunnel, OCC	MEP, Power
SR-113	Adequate safety integrity level shall be ensured for switchover function of signaling systems between ETCS and CBTC at Bicutan station.	SIG
SR-114	Provision of emergency lighting system in the tunnel for emergency evacuation.	MEP
SR-115	Fire and smoke detection function shall be ensured in tunnel and in train and it shall be reported to the Operator as alarm for the appropriate course of action.	MEP
SR-116	Tunnels shall be equipped with fire suppression systems for the emergency services. These shall comply with the relevant codes of practice/standards.	MEP
SR-117	Provision of smoke extraction system in stations, Tunnel, Depots (wherever applicable).	MEP
SR-118	Adequate insulation, earthing and bonding of all MEP and E&M Systems equipment as per relevant standards.	SYS, MEP
SR-119	Substation buildings within the TSS premises shall have fire resistant barriers, flame, heat and smoke detection, and automatic gas suppression systems.	Power, MEP
SR-120	Electronic Access Control system shall be provided in important rooms each station, each substation and each depot.	TEL, MEP
SR-121	Object detection system shall be provided in PSD and Train door system to detect intrusion of trespassers between PSD and Train	RS, PSD
SR-122	Grounding and bonding provision to connect between track slab and viaduct superstructure/Walkway/OCS Pole.	TWK, SYS

Serial No.	Safety Requirement Description	Subsystem
SR-123	The firefighting equipment shall be controlled directly from the fire alarm control panel	MEP
SR-124	The PA (Passenger Announcement) system shall comply to NFPA 72 and NFPA 130	TEL

Note: The above safety requirements listed in the table are minimum and Contractor shall elaborate the list based on their analysis.

A7 PSD’s

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	NS-01	<p>CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, bolt sizes, and drilling methods.</p> <p>CP NS-01 Contractor shall ensure that type of bolts supplied match the fixing provisions and that adequate construction tolerances are allowed between the fixings and the mounting slots.</p>
2	Recesses and trenches formed in screed or finishes for CP NS-01 services	CP NS-01	CP NS-01	CP05 or CPNS01*	CP05 or CPNS01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 Contractor shall provide adequate thicknesses of screed and finishes.</p> <p>CP05 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
3	Cast-in sockets including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 shall supply all necessary materials and templates.</p>
4	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, cable tray, cable ladders and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP05 or CPNS01*	CP05 or CPNS01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 Contractor shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP05 Contractor shall protect all ends and joints or conduits and boxes.</p>

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
						<p>The conduits and boxes shall be supplied and installed by the CP NS-01 Contractor.</p> <p>Providing electrical continuity between conduit and rebar shall be done by CP05 Contractor under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP05 and NS-01 Contractors before casting and confirmed after casting.</p>
6	Facilities in PSD room i.e earthing terminals, air conditioning ,lighting, fire protection, concrete plinth, floor and wall finishes,	CP NS-01	CP-05	CP-05	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>Main earthing system and connection to earthing terminal for PSD room shall be provided by CP05 Contractor.</p>
7	Power supply : The power supply shall be connected from the System Main Power Distribution Board	CP NS-01	CP NS-01	CP NS-01*, CP05	CP NS-01*, CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p>
8	Insulation Membrane	CP NS-01	CP05	CP05	CP05	<p>Membrane to be installed by CP01 and CP02. CP NS-01 to supervise and assist in the testing of the insulation of the platform floor insulation membrane installed by the civil contractor.</p>

*If NS-01 do not provide information timely then the material and installation work shall be undertaken by NS-01

ANNEX 4 – Civil Packages CP01 and CP02

A.7 Platform Screen Doors

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	CPNS-01	<p>CP01 and 02, and NS-01 Contractors shall coordinate and agree on the location, bolts size, and drilling method.</p> <p>CP NS-01 Contractor shall ensure that type of boll supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots.</p>
2	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 01 and 02 or CPNS01*	CP01 and 02 or CPNS01*	<p>CP01, 02, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP01 and 02 Contractors shall provide adequate thickness of screed or finishes.</p> <p>CP01 and 02 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
3	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP01, 02 and/or NS-01	<p>CP01, 02 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP NS-01 Contractor shall supply all necessary materials and templates.</p>
4	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, cable ladders and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP01 and 02 or CPNS01*	<p>CP01, 02 and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>CP01, 02 Contractor shall execute that the finishing work of the infilling gap between a wall and a box/conduit which is scheduled to install at the wall in advance.</p> <p>The protection of all ends and joints shall be executed by CP01, 02 Contractor.</p> <p>The conduits shall be assembled by CP NS-01 Contractor.</p> <p>Fixing of conduits to the re-bar shall be executed by CP01, 02 Contractors under CP NS-01 Contractor’s supervision.</p> <p>CP01, 02 and NS-01 Contractors shall implement jointly an inspection before casting.</p>

6	Facilities in PSD room i.e earthing terminals, air conditioning, lighting, fire protection, concrete plinth, floor and wall finishes,	CP NS-01	CP-01& CP02	CP-01& CP02	CP-01& CP02	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.. Main earthing system and connection to earthing terminal for PSD room shall be provided by CP01 & CP02 Contractor.
7	Power supply : The power supply shall be connected from the System Main Power Distribution Board	CP NS-01	CP NS-01	CP NS-01*, CP-01& CP02	CP NS-01*, CP-01& CP02	CP01, CP02 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Insulation Membrane	CP NS-01	CP01 and 02	CP01 and 02	CP01 and 02	Membrane to be installed by CP01 and CP02. CP NS-01 to supervise and assist in the testing of the insulation of the platform floor insulation membrane installed by the civil contractor.

*If NS-01 do not provide information timely then the material and installation work shall be undertaken by NS-01

Please note that design requirement mentioned in the above Annexes are not exhaustive. The Contractor will further elaborate the requirements in close co-ordination with interface Contractors. Associated Interfaces works not mentioned in the above tables but which may be inferred to be necessary for stability, or completion, or effective interface & integration or the safe reliable and efficient operation of the Works to be carried out by the Contractor. The Interface work shall include any work which is necessary to satisfy the Employer’s Requirements, the Contractor's Proposal and Schedules, or is implied by the Contract, or arises from any obligation of the Contractor and shall be Fit for the Purposes for which they are intended.

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
WITH MMSP AND NSCR**

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
 WITH NSCR**

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
Trackwork	<p>Track work demarcation shall follow from civil demarcation line at Ch. 34k749.081 (North of Malolos Station)</p> <p>Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.</p> <p>Necessary track-bed construction at Civil demarcation line Ch. 34+749.081 (PR7-120 North of Malolos Station)</p> <p>Rail adjustment and connection at CP04 side for migration.</p>	<p>Track work demarcation shall follow from demarcation line at Ch. 34k749.081 (North of Malolos Station)</p> <p>Track bed and rail laying shall follow Civil demarcation line at Ch. 34+749.081 (PR7-120S at North of Malolos Station)</p> <p>Install Buffer stop.</p>	<p>All track and associated work shall start at PR1-64 Ch. 0+495 South of Solis Station.</p> <p>Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.</p> <p>Rail adjustment and connection at CP04 side for migration</p>	<p>All track and associated work shall be done up to PR1-64 Ch. -0+495 South of Solis Station.</p> <p>Install Buffer-stop</p>
Signaling	NS-01 shall follow track demarcation for Signaling works	CP04 shall follow track demarcation for Signaling	NS-01 shall follow track demarcation for Signaling works	CP04 shall follow track demarcation for Signaling works

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
	<p>NS-01 shall terminate signal/data cables in the SER of N1 section There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability. If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N2 and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.</p> <p>During design stage there shall be interface with CP04 for deciding various parameters of ETCS There shall be interface for Integrated OCC (IOCC) for overall control from Mabalacat OCC.</p>	<p>works CP04 shall connect their equipment to cable terminations done by NS-01 CP04 shall interface for CBI, ETCS and ATS level. CP04 shall interface for common parameters of ETCS including RBC demarcation handover. If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and N2 train detection system. CP04 and NS-01 shall coordinate to achieve this.</p> <p>CP04 shall interface for transfer of control to IOCC.</p>	<p>NS-01 shall terminate signal/data cables in the SER of N1 section There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability. If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by SC and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.</p> <p>During design stage there shall be interface with CP04 for deciding various parameters of ETCS. There shall be interface for Integrated OCC (IOCC) for overall control from Mabalacat OCC.</p>	<p>CP04 shall connect their equipment to cable terminations done by NS-01 CP04 shall interface for CBI, ETCS and ATS level. CP04 shall interface for common parameters of ETCS. CP04 shall interface for transfer of control to IOCC. If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and SC train detection system. CP04 and NS-01 shall coordinate to achieve this.</p>

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
Telecoms	<p>NS-01 will follow the Telecoms Work Demarcation with CP04 for all Telecom Systems works. NS-01 will terminate all Telecom Systems work at CP04's Malolos Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done at CP04's Malolos Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>CP04 will facilitate and provide all the necessary terminations for NS-01 at Malolos Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done at CP04's Malolos Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>NS-01 will follow the Telecoms Work Demarcation with CP04 for all Telecom Systems works. NS-01 will terminate all Telecom Systems work at CP04's Solis Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done in CP04's Solis Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>CP04 will facilitate and provide all the necessary terminations for NS-01 at Solis Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done in CP04's Solis Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>
Power Supply	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.
Power Distribution	6.6kV distribution cable from interconnecting 6.6 kV switchgear VCB in TSS No.9 to SS No.10 shall be scope of NS-01.	6.6kV switchgear VCB in TSS9 shall be scope of CP-04	Supply and install 6.6kV distribution cables from SS No.1 to Solis Station's 6.6 kV switchgear incomer.	Provision of 6.6 kV switchgear in Solis Station for 6.6kV distribution cable from SS No.1 provided by NS-01. The 6.6 kV cables from Solis to TSS 2 is under CP04 scope.
Overhead Line	Overlaps from adjacent tensions lengths	Overlaps from adjacent tensions lengths	Overlaps from adjacent tensions lengths. Splicing onto adjacent tension length maybe necessary subject to the detailed design for	Overlaps from adjacent tensions lengths. Splicing onto adjacent tension length maybe necessary subject to the detailed design for this

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
			this area.	area.
Platform Screen Door	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01
CMMS	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.
AFC	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04. Tutuban station will be connected to the NS-01 network infrastructure following telecoms.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP04. Tutuban station will be connected to the NS-01 network infrastructure following telecoms.
Training	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
 WITH MMSP**

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
Trackwork	<p>Bicutan Station (Southside)</p> <p>The block joint in between the double-ended points of Northbound and Southbound lines with NSCR lines will act as a boundary limits for the respective projects.</p> <p>IRJ will be supplied by NS-01.</p>	<p>Bicutan Station (Southside)</p> <p>The block joint in between the double-ended points of Northbound and Southbound lines with NSCR lines will act as a boundary limits for the respective projects.</p>	<p>Rail-wheel interface study</p>	<p>Provision of wheel interface information to be used in rail-wheel interface study</p>
Signaling	<p>In addition to the track demarcation, NS-01 shall supply, install, test and commission signaling way side at MMSP line in coordination with CP106 for interoperability.</p> <p>There shall be interface at CBI level for availability of route, exchange of slots and train approaching station</p> <p>The interface shall cover</p>	<p>CP106 shall install way side equipment on MMSP track in coordination with NS-01 for normal train operation as well as for interoperability.</p> <p>There shall be interface at CBI level for availability of route, exchange of slots and train approaching station</p> <p>The interface shall cover operation of PSDs from the Signaling system in-charge at</p>	<p>NS-01 shall supply, install, test and commission GSM-R radio on CP107 Rolling stock and CP107 Simulator. For this purpose, NS-01 shall develop interface matrix for all related aspects with CP107 matrix and interface at all stages of the project with NS-01</p>	<p>CP107 shall interface for development of interface matrix and interface at all stages of the project with NS-01.</p>

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
	<p>operation of PSDs from the Signaling system in-charge at that time.</p> <p>NS-01 shall interface with CP106 and CP107 for design, installation, testing and commission of on -board ETCS system interfaces with on-board CBTC system on CP107 Rolling stock,</p> <p>NS-01 shall interface with CP106 for MMSP Depot test track for set up test facility for ETCS</p>	<p>that time.</p> <p>CP106 shall interface with NS-01 for design, installation, testing and commission of on -board CBTC system interfaces with on-board ETCS system on CP107 Rolling stock,</p> <p>CP106 shall interface for MMSP Depot test track for Train testing in ETCS mode by NS-01.</p>		
Telecoms	<p>NS-01 will follow the Telecoms Work Demarcation with CP106 for all Telecom Systems works. NS-01 will facilitate and provide all Telecom Systems work terminations for CP106 either or both at FTI and Bicutan Stations.</p> <p>NS-01 will provide connectivity for the Backbone, Radio Systems (GSM-R), PABX, PA System.</p>	<p>CP106 will follow the Telecoms Work Demarcation with NS-01 for all Telecom Systems works. CP106 will terminate all Telecom Systems work termination to NS-01 either or both at FTI and Bicutan Stations.</p> <p>CP106 will supply all equipment to connect to the NSCR backbone system.</p> <p>CP106 will supply, install, test,</p>	<p>NS-01 shall supply, install, test, and commission GSM-R radio on CP107 Rolling stock. For this purpose, NS-01 shall develop an interface matrix for all related aspects with CP107 matrix and interface at all stages of the project with NS-01</p>	<p>CP107 shall interface for the development of an interface matrix and interface at all stages of the project with NS-01.</p>

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
	<p>NS-01 will supply, test, and commission the on-board equipment for CP106.</p> <p>NS-01 will supply, install, test, and commission the Clocks for CP106 at both FTI and Bicutan stations.</p>	<p>and commission the equipment for Millimeter-wave, Backbone Radio System (CBTC), PABX, PIDS.</p> <p>CP106 will install the GSM-R onboard equipment on their trains.</p>		
Power Supply	<p>Bicutan Station No interface with MMSP</p> <p>FTI Station No interface with MMSP</p>	<p>Bicutan Station No interface with NS-01</p> <p>FTI Station No interface with NS-01</p>	Power simulation will cover CP107 trains running on the NSCR	Train parameters shall be provided for the power simulation.
Power Distribution	<p>Bicutan Station NS-01 shall provide complete LV (400V/230V) power distribution to Bicutan station shall be scope of NS-01</p> <p>FTI Station 6.6kV distribution cable from SS No.S5 to FTI station at upper-level Electrical room shall be scope of NS-01</p>	<p>Bicutan Station MMSP shall receive a complete LV (400V/230V) power distribution from NS-01.</p> <p>FTI Station 6.6kV distribution cable from FTI SS (scope of MMSP) to FTI station at lower level Electrical room shall be scope of MMSP</p>		

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
Overhead Line	Cross over tension length and section insulator to be provided NS-01. This overlap will cross over the MMSP tension length running to the MMSP Bicutan end of the line.	Cross over tension length and section insulator to be provided NS-01. This overlap will cross over the MMSP tension length running to MMSP Bicutan end of line	Dynamic Simulation shall be undertaken by NS-01. This shall include the operation of the CP107 rolling stock,	Train and pantograph parameters shall be provided for the dynamic simulation simulation.
Platform Screen Door	PSD’s for both platforms at Bicutan by NS-01	PSD’s for both platforms at Bicutan by NS-01		
CMMS/MMS	NS-01 to provide numbering convention details for MMSP CMMS/MMS system.	CP106 MMS systems to accommodate NS-01 CMMS requirement and implement the standards throughout the project.		
AFC	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP106. Tickets purchased on NSCR stations including those for the Limited Express service shall enable passengers to alight at MMSP stations.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP106. Tickets purchased on MMSP stations shall enable passengers, including those taking the Limited Express Service to alight at NSCR stations.		

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
		The Limited Express tickets issued shall be capable of being validated onboarding the Limited Express services as per limited Express tickets issued at NSCR station.		
Training	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.		

End of Section

A7 PSD’s

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	NS-01	<p>CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, bolt sizes, and drilling methods.</p> <p>CP NS-01 Contractor shall ensure that type of bolts supplied match the fixing provisions and that adequate construction tolerances are allowed between the fixings and the mounting slots.</p>
2	Recesses and trenches formed in screed or finishes for CP NS-01 services	CP NS-01	CP NS-01	CP05 or CPNS01*	CP05 or CPNS01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 Contractor shall provide adequate thicknesses of screed and finishes.</p> <p>CP05 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
3	Cast-in sockets including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 shall supply all necessary materials and templates.</p>
4	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, cable tray, cable ladders and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP05 or CPNS01*	CP05 or CPNS01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 Contractor shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP05 Contractor shall protect all ends and joints or conduits and boxes.</p>

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
						<p>The conduits and boxes shall be supplied and installed by the CP NS-01 Contractor.</p> <p>Providing electrical continuity between conduit and rebar shall be done by CP05 Contractor under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP05 and NS-01 Contractors before casting and confirmed after casting.</p>
6	Facilities in PSD room i.e earthing terminals, air conditioning ,lighting, fire protection, concrete plinth, floor and wall finishes,	CP NS-01	CP-05	CP-05	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>Main earthing system and connection to earthing terminal for PSD room shall be provided by CP05 Contractor.</p>
7	Power supply : The power supply shall be connected from the System Main Power Distribution Board	CP NS-01	CP NS-01	CP NS-01*, CP05	CP NS-01*, CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p>
8	Insulation Membrane	CP NS-01	CP05	CP05	CP05	<p>Membrane to be installed by CP01 and CP02. CP NS-01 to supervise and assist in the testing of the insulation of the platform floor insulation membrane installed by the civil contractor.</p>

*If NS-01 do not provide information timely then the material and installation work shall be undertaken by NS-01

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ANNEX 4 – Civil Packages CP01 and CP02

A.7 Platform Screen Doors

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	CPNS-01	CP01 and 02, and NS-01 Contractors shall coordinate and agree on the location, bolts size, and drilling method. CP NS-01 Contractor shall ensure that type of boll supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots.
2	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 01 and 02 or CPNS01*	CP01 and 02 or CPNS01*	CP01, 02, and NS-01 Contractors shall coordinate and agree on the size and location. CP01 and 02 Contractors shall provide adequate thickness of screed or finishes. CP01 and 02 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.
3	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP01, 02 and/or NS-01	CP01, 02 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
4	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, cable ladders and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP01 and 02 or CPNS01*	CP01, 02 and NS-01 Contractor shall coordinate and agree on the size and location. CP01, 02 Contractor shall execute that the finishing work of the infilling gap between a wall and a box/conduit which is scheduled to install at the wall in advance. The protection of all ends and joints shall be executed by CP01, 02 Contractor. The conduits shall be assembled by CP NS-01 Contractor. Fixing of conduits to the re-bar shall be executed by CP01, 02 Contractors under CP NS-01 Contractor’s supervision. CP01, 02 and NS-01 Contractors shall implement jointly an inspection before casting.

6	Facilities in PSD room i.e earthing terminals, air conditioning, lighting, fire protection, concrete plinth, floor and wall finishes,	CP NS-01	CP-01& CP02	CP-01& CP02	CP-01& CP02	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.. Main earthing system and connection to earthing terminal for PSD room shall be provided by CP01 & CP02 Contractor.
7	Power supply : The power supply shall be connected from the System Main Power Distribution Board	CP NS-01	CP NS-01	CP NS-01*, CP-01& CP02	CP NS-01*, CP-01& CP02	CP01, CP02 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Insulation Membrane	CP NS-01	CP01 and 02	CP01 and 02	CP01 and 02	Membrane to be installed by CP01 and CP02. CP NS-01 to supervise and assist in the testing of the insulation of the platform floor insulation membrane installed by the civil contractor.

*If NS-01 do not provide information timely then the material and installation work shall be undertaken by NS-01

Please note that design requirement mentioned in the above Annexes are not exhaustive. The Contractor will further elaborate the requirements in close co-ordination with interface Contractors. Associated Interfaces works not mentioned in the above tables but which may be inferred to be necessary for stability, or completion, or effective interface & integration or the safe reliable and efficient operation of the Works to be carried out by the Contractor. The Interface work shall include any work which is necessary to satisfy the Employer’s Requirements, the Contractor's Proposal and Schedules, or is implied by the Contract, or arises from any obligation of the Contractor and shall be Fit for the Purposes for which they are intended.

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
WITH MMSP AND NSCR**

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
 WITH NSCR**

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
Trackwork	<p>Track work demarcation shall follow from <u>civil</u> demarcation line at Ch. 34k749.081<u>34k751</u> (North of Malolos Station)</p> <p><u>Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.</u></p> <p><u>Necessary track-bed construction at Civil demarcation line Ch. 34+749.081 (PR7-120 North of Malolos Station)</u></p> <p><u>Rail adjustment and connection at CP04 side for migration.</u></p>	<p>Track work demarcation shall follow from demarcation line at Ch. 34k751<u>34k749.081</u> (North of Malolos Station)</p> <p><u>Track bed and rail laying shall follow Civil demarcation line at Ch. 34+749.081 (PR7-120S at North of Malolos Station)</u></p> <p><u>Install Buffer stop.</u></p>	<p>All track and associated work shall start at PR1-64 Ch. 0+495 South of Solis Station.</p> <p><u>Removal of buffer-stop installed by CP04 and necessary track bed construction after removal of buffer stop.</u></p> <p><u>Rail adjustment and connection at CP04 side for migration</u></p>	<p>All track and associated work shall be done up to PR1-64 Ch. -0+495 South of Solis Station.</p> <p><u>Install Buffer-stop</u></p>
Signaling	NS-01 shall follow track demarcation for Signaling works	CP04 shall follow track demarcation for Signaling	NS-01 shall follow track demarcation for Signaling works	CP04 shall follow track demarcation for Signaling works

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
	<p>NS-01 shall terminate signal/data cables in the SER of N1 section There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability. <u>If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N2 and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.</u></p> <p>During design stage there shall be interface with CP04 for deciding various parameters of ETCS There shall be interface for Integrated OCC (IOCC) for overall control from Mabalacat OCC.</p>	<p>works CP04 shall connect their equipment to cable terminations done by NS-01 CP04 shall interface for CBI, ETCS and ATS level. CP04 shall interface for common parameters of ETCS including RBC demarcation handover. <u>If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and N2 train detection system. CP04 and NS-01 shall coordinate to achieve this.</u></p> <p>CP04 shall interface for transfer of control to IOCC.</p>	<p>NS-01 shall terminate signal/data cables in the SER of N1 section There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability. <u>If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by SC and N1 train detection system. NS-01 and CP04 shall coordinate to achieve this.</u></p> <p>During design stage there shall be interface with CP04 for deciding various parameters of ETCS. There There shall be interface for Integrated OCC (IOCC) for overall control from Mabalacat OCC.</p>	<p>CP04 shall connect their equipment to cable terminations done by NS-01 CP04 shall interface for CBI, ETCS and ATS level. CP04 shall interface for common parameters of ETCS. CP04 shall interface for transfer of control to IOCC. <u>If necessary, there shall be a way of physical connection of immediate track circuit at the demarcation line such that train at the demarcation track section can be both detected by N1 and SC train detection system. CP04 and NS-01 shall coordinate to achieve this.</u></p>

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
Telecoms	<p>NS-01 will follow the Telecoms Work Demarcation with CP04 for all Telecom Systems works. NS-01 will terminate all Telecom Systems work at CP04's Malolos Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done at CP04's Malolos Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>CP04 will facilitate and provide all the necessary terminations for NS-01 at Malolos Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done at CP04's Malolos Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>NS-01 will follow the Telecoms Work Demarcation with CP04 for all Telecom Systems works. NS-01 will terminate all Telecom Systems work at CP04's Solis Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done in CP04's Solis Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>	<p>CP04 will facilitate and provide all the necessary terminations for NS-01 at Solis Station.</p> <p>All Telecom Interfaces between NS-01 and CP04 will be done in CP04's Solis Station.</p> <p>There will also be an interface between NS-01 and CP04 with regards to the requirements of IOCC in Mabalacat Depot.</p>
Power Supply	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.	PSCADA and Intertripping between substations.
Power Distribution	6.6kV distribution cable from interconnecting 6.6 kV switchgear VCB in TSS No.9 to SS No.10 shall be scope of NS-01.	6.6kV switchgear VCB in TSS9 shall be scope of CP-04	Supply and install 6.6kV distribution cables from SS No.1 to Solis Station's 6.6 kV switchgear incomer.	Provision of 6.6 kV switchgear in Solis Station for 6.6kV distribution cable from SS No.1 provided by NS-01. The 6.6 kV cables from Solis to TSS 2 is under CP04 scope.
Overhead Line	Overlaps from adjacent tensions lengths	Overlaps from adjacent tensions lengths	Overlaps from adjacent tensions lengths. Splicing onto adjacent tension length maybe necessary subject to the detailed design for	Overlaps from adjacent tensions lengths. Splicing onto adjacent tension length maybe necessary subject to the detailed design for this

Discipline	NSCR Interface at Malolos		NSCR Interface at Solis, Blumentritt and Tutuban Junction	
	NS-01	CP04	NS-01	CP04
			this area.	area.
Platform Screen Door	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01	PSD’s for all stations by NS-01
CMMS	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.	CP NS-01 CMMS shall interface with CP 04 MMS for exchanging the database and common GUI.
AFC	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below equipment between NS-01 and CP04. Tutuban station will be connected to the NS-01 network infrastructure following telecoms.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP04. Tutuban station will be connected to the NS-01 network infrastructure following telecoms.
Training	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.	Train Simulator and Signaling Simulator database exchange.

**APPENDIX 8- OUTLINE INTERFACE DEMARCATION
 WITH MMSP**

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
Trackwork	<p>Bicutan Station (Southside)</p> <p>The block joint in between the double-ended points of Northbound and Southbound lines with NSCR lines will act as a boundary limits for the respective projects.</p> <p>IRJ will be supplied by NS-01.</p>	<p>Bicutan Station (Southside)</p> <p>The block joint in between the double-ended points of Northbound and Southbound lines with NSCR lines will act as a boundary limits for the respective projects.</p>	<p>Rail-wheel interface study</p>	<p>Provision of wheel interface information to be used in rail-wheel interface study</p>
Signaling	<p>In addition to the track demarcation, NS-01 shall supply, install, test and commission signaling way side at MMSP line in coordination with <u>CP106</u> CP04 for interoperability.</p> <p>There shall be interface at CBI level for availability of route, exchange of slots and train approaching station</p> <p>The interface shall cover</p>	<p>CP106 shall install way side equipment on MMSP track in coordination with NS-01 for normal train operation as well as for interoperability.</p> <p>There shall be interface at CBI level for availability of route, exchange of slots and train approaching station</p> <p>The interface shall cover operation of PSDs from the Signaling system in-charge at</p>	<p>NS-01 shall supply, install, test and commission GSM-R radio on CP107 Rolling stock and <u>CP107 Simulator</u>. For this purpose, NS-01 shall develop interface matrix for all related aspects with CP107 matrix and interface at all stages of the project with NS-01</p>	<p>CP107 shall interface for development of interface matrix and interface at all stages of the project with NS-01.</p>

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
	<p>operation of PSDs from the Signaling system in-charge at that time.</p> <p>NS-01 shall interface with CP106 and CP107 for design, installation, testing and commission of on-board ETCS system interfaces with on-board CBTC system on CP107 Rolling stock,</p> <p>NS-01 shall interface with CP106 for MMSP Depot test track for set up test facility for ETCS</p>	<p>that time.</p> <p>CP106 shall interface with NS-01 for design, installation, testing and commission of on-board CBTC system interfaces with on-board ETCS system on CP107 Rolling stock,</p> <p>CP106 shall interface for MMSP Depot test track for Train testing in ETCS mode by NS-01.</p>		
Telecoms	<p>NS-01 will follow the Telecoms Work Demarcation with CP106 for all Telecom Systems works. NS-01 will facilitate and provide all Telecom Systems work terminations for CP106 either or both at FTI and Bicutan Stations.</p> <p>NS-01 will provide connectivity for the Backbone, Radio Systems (GSM-R), PABX, PA System.</p>	<p>CP106 will follow the Telecoms Work Demarcation with NS-01 for all Telecom Systems works. CP106 will terminate all Telecom Systems work termination to NS-01 either or both at FTI and Bicutan Stations.</p> <p>CP106 will supply all equipment to connect to the NSCR backbone system.</p> <p>CP106 will supply, install, test,</p>	<p>NS-01 shall supply, install, test, and commission GSM-R radio on CP107 Rolling stock. For this purpose, NS-01 shall develop an interface matrix for all related aspects with CP107 matrix and interface at all stages of the project with NS-01</p>	<p>CP107 shall interface for the development of an interface matrix and interface at all stages of the project with NS-01.</p>

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
	<p>NS-01 will supply, test, and commission the on-board equipment for CP106.</p> <p>NS-01 will supply, install, test, and commission the Clocks for CP106 at both FTI and Bicutan stations.</p>	<p>and commission the equipment for Millimeter-wave, Backbone Radio System (CBTC), PABX, PIDS.</p> <p>CP106 will install the GSM-R onboard equipment on their trains.</p>		
Power Supply	<p>Bicutan Station No interface with MMSP</p> <p>FTI Station No interface with MMSP</p>	<p>Bicutan Station No interface with NS-01</p> <p>FTI Station No interface with NS-01</p>	Power simulation will cover CP107 trains running on the NSCR	Train parameters shall be provided for the power simulation.
Power Distribution	<p>Bicutan Station NS-01 shall provide complete LV (400V/230V) power distribution to Bicutan station shall be scope of NS-01</p> <p>FTI Station 6.6kV distribution cable from SS No.S5 to FTI station at upper-level Electrical room shall be scope of NS-01</p>	<p>Bicutan Station MMSP shall receive a complete LV (400V/230V) power distribution from NS-01.</p> <p>FTI Station 6.6kV distribution cable from FTI SS (scope of MMSP) to FTI station at lower level Electrical room shall be scope of MMSP</p>		

Discipline	MMSP INTERFACE			
	NS-01	CP106	NS-01	CP107
Overhead Line	Cross over tension length and section insulator to be provided NS-01. This overlap will cross over the MMSP tension length running to the MMSP Bicutan end of the line.	Cross over tension length and section insulator to be provided NS-01. This overlap will cross over the MMSP tension length running to MMSP Bicutan end of line	Dynamic Simulation shall be undertaken by NS-01. This shall include the operation of the CP107 rolling stock,	Train and pantograph parameters shall be provided for the dynamic simulation simulation.
Platform Screen Door	PSD’s for both platforms at Bicutan by NS-01	PSD’s for both platforms at Bicutan by NS-01		
CMMS/MMS	NS-01 to provide numbering convention details for MMSP CMMS/MMS system.	CP106 MMS systems to accommodate NS-01 CMMS requirement and implement the standards throughout the project.		
AFC	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP106. Tickets purchased on NSCR stations including those for the Limited Express service shall enable passengers to alight at MMSP stations.	Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP106. Tickets purchased on MMSP stations shall enable passengers, including those taking the Limited Express Service to alight at NSCR stations.		

Subject	Organization	Standard
Quality Management and quality assurance	ISO	ISO 9000
Installation work and lineside assets	Railtrack	GS/IH0001 or an acceptable equivalent
Network time protocol	Network Working Group	RFC 1305
Ethernet Network Standard	IEEE	IEEE Std 802.3
Recommendation Practice for Determining Smoke Generation of Solid Materials	NFPA	NFPA 258

2.4 Scope of Work

2.4.1 General

The scope of work describes the requirements for a Train Control System using ETCS Level 2 (Baseline 3 Release 2 or later) and GSM-R (Packet switched) to constitute an ERTMS signaling system for the NSCR-Ex {Malolos to Clark (MCRP) and Solis to Calamba (NSRP)} (This shall include Depots using ETCS Level-1, which shall be located at Mabalacat and Banlic. The OCC for MCRP shall be at Mabalacat depot and the OCC for NSRP shall be at Banlic depot.

- The Malolos to Clark Railway Project (MCRP) also called NSCR-N2 is northern part of the North to South Commuter Railway Project Extension (NSCR-EX).
- The Solis to Calamba project forms the southern part of North to South Commuter Railway Project Extension (NSCR-EX) and is also called NSRP – South.
- The quantity of Rolling Stock EMU units to be equipped with ERTMS onboard and commissioned by the Contractor are as follows:
 - 7 x 8 Car Limited Express
 - 38 x 8 Car Commuter trains
 - 30 x 8 Car Trains from MMSP line (to be fitted with CBTC and ERTMS systems onboard. CBTC system supplied by others)
- This will interface to an adjacent section; the Malolos to Solis project also called (NSCR-N1) being done by a separate team. The depot and OCC for NSCR-N1 is located at Malanday. NSCR-N1 is in the middle of MCRP and NSRP.
- NSCR-N1 project will interface with the adjacent Solis to Calamba project that forms the southern part of (NSCR-EX) also called NSRP - South.
- All three sections described above form a single railway line.
- It also interfaces to the MMSP project, A CBTC Signaling project being undertaken by others.
- The Works to be executed under the Contract include the design, manufacture / procurement, verification, delivery, installation, testing, commissioning and

Subject	Organization	Standard
Quality Management and quality assurance	ISO	ISO 9000
Installation work and lineside assets	Railtrack	GS/IH0001 or an acceptable equivalent
Network time protocol	Network Working Group	RFC 1305
Ethernet Network Standard	IEEE	IEEE Std 802.3
Recommendation Practice for Determining Smoke Generation of Solid Materials	NFPA	NFPA 258

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- The Works to be executed under the Contract include the design, manufacture / procurement, verification, delivery, installation, testing, commissioning and

technical support for a complete, integrated ERTMS / ETCS Level 2 system with GSM-R as the Radio sub-system, including a new control center, trackside, and train borne equipment, accessories and fixtures and fittings necessary to deliver the requirements of this Technical Requirements.

- In addition, use for ETCS data transmission, GSM-R radio system shall also provide for train operational communications including Railway Emergency calls, broadcast calls, group calls and packet data. Users will include train drivers, dispatchers, operational controllers, shunting groups. Fixed terminal devices and mobiles phones will need to be provided. Further details specify by train operations.
- There is an Option for ATO. The ATO sub-system to be designed, tested and installed as part of this project based on the UNISIG standard for ATO over ETCS. This will consist of an onboard and trackside sub-system. Implementing ATO will increase the capacity of the line, ensure time-table adherence and reduce energy consumption. If ATO is not implemented, normal train operating mode will be ATP with manual driving by the Driver.
- Any clauses for ATO in this document will not apply if this Option is not exercised. With ATO, normal train operations on the main lines and depot access shall be automatic providing speed control, accurate stopping, door opening and closing at a grade of automation 2 (GoA2) - semi-automated train operation with Driver in the cab. The Contractor shall co-ordinate with NSCR-N1 Contractor for effective and efficient interoperable Automatic Train Operation (ATO). The Contractor shall supply all the necessary onboard ATP/ATO software updates/modifications needed for interoperable operation with NSCR-N1.
- This scope also covers the provision of all onboard equipment for all track mounted maintenance vehicles and Shunting Locomotive(Engine type) (refer Chapter 8, Depot Facilities, Appendix 8.1, A N41.02,). Please refer to chapters ERT 1. Track works and chapter ERT 6. Overhead Contact Line System for details of maintenance vehicles. The contractor shall develop interface between Signaling and these vehicles and obtain Notice of No Objection from the Engineer.
- The Contractor shall provide the equipment's and support for the Rolling Stock mock-up activities of MMSP Package CP 107 at the CP 107 Rolling Stock Contractor's facilities. Further detail shall be developed by the Contractor and submit to the Engineer for review during the interface activities between the Contractor and CP 107 Rolling Stock Contractor.
- This scope also covers the signaling interface with MMSP line that will be signaled with CBTC and the provision of all onboard ERTMS equipment for the MMSP rolling stock to enable train running on the NSCR-South.
- The contractor shall supply and implement Key Management system (with at least 25% spare capacity) for ETCS system complying to UNISIG subset 037, 038, 114, 137 and other relevant subsets for complete line from Clark to Calamba including NSCR section being constructed by CP04. For this purpose, the contractor shall interface with CP04.
- The demarcation of the work shall be as provided in the Track work drawings (in ERD) and as defined in clause 2.26.10, Interface between NSCR-EX and MMSP projects.

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- The Contractor shall provide the equipment's and support for the Rolling Stock mock-up activities of MMSP Package CP 107 at the CP 107 Rolling Stock Contractor's facilities. Further detail shall be developed by the Contractor and submit to the Engineer for review during the interface activities between the Contractor and CP 107 Rolling Stock Contractor.
- This scope also covers the signaling interface with MMSP line that will be signaled with CBTC and the provision of all onboard ERTMS equipment for the MMSP rolling stock to enable train running on the NSCR-South.
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- The demarcation of the work shall be as provided in the Track work drawings (in ERD) and as defined in clause 2.26.10, Interface between NSCR-EX and MMSP projects.

- 15) Any other service needed to provide a complete GSM-R based ETCS Level 2 system
- 16) The Contractor shall supply furniture i.e. chairs, tables, cabinets, etc. (the design and quantity of the furniture shall be submitted by the Contractor and for review by the Engineer) in the following rooms:
 - a) OCC Control Room;
 - b) Station Control Room;
 - c) Signaling Maintenance Room;
 - d) Signaling Equipment Room;
 - e) Both Depot Signaling equipment rooms;
 - f) Signaling Training rooms in Mabalacat depot; and
 - g) Signaling equipment repair and maintenance shop in Mabalacat Depot Workshop Area.
 - h) Network Monitoring centre OCC/IOCC,
 - i) Depot control

2.7.2 Work Excluded from this Contract

The Contractor shall refer to the relevant Interface Specifications in the Appendices for the specific demarcation of responsibility and supply with other Interfacing Contractors.

Services to be provided by other Interfacing Contractors shall include:

- 1) Equipment Rooms: All equipment rooms will be provided by the Civil Works Contractors;
- 2) Earthing Pits: Shared main earth shall be available for shared use by the Contractor. The Contractor shall set up an earth busbar in the Signal Equipment Room (SER) and other locations where Train Control equipment are located;
- 3) Rolling Stock Equipment: See Appendix A1 for details;

2.7.3 Outdoor Cables

The main fiber Optic backbone cables shall be supplied by the Communications system. The Contractor shall provide their Input / Output requirements and agree the quantity of fibers required as part of the interface plan as necessitated by both systems. The requirement shall be submitted in writing accompanied with any calculations / supporting details / cable plans.

2.8 Performance Requirements

2.8.1 General

- 1) The ERTMS / ETCS System shall achieve all performance requirements as provided in the relevant technical specifications.

All the sub systems, equipment to be used for ERTMS / ETCS Level 2 System (including but not be limited to ATP, ATS, CBI, GSM-R, RBC and ATO) shall be of proven design, ratified by Independent Safety Assessor and shall have been successfully implemented in transit systems currently in operation.

- 14) All equipment necessary to allow the installation, testing and introduction of services on these lines; and
- 15) Any other service needed to provide a complete GSM-R based ETCS Level 2 system
- 16) The Contractor shall supply furniture i.e. chairs, tables, cabinets, etc. (the design and quantity of the furniture shall be submitted by the Contractor and for review by the Engineer) in the following rooms:
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- 2) Trackside signaling systems including point machine, train detection, signals (where required), balises, Input/output modules, associated adapters and power supplies shall be of proven design and shall have been successfully implemented in transit systems currently in operation.)
- 3) The Contractor shall provide documented evidence from end-users of transit systems that the proposed sub-systems / equipment has been performing satisfactorily and no unsafe failures have been encountered.
- 4) The Built-in diagnostics and remote monitoring functions for each microprocessor-based equipment module of the ETCS System shall be provided by the Contractor.
- 5) The maintenance processes and procedures shall be planned, integrated and developed in conjunction with the operating environment, and the design, development and production functions to permit the most cost- effective achievement of the system and equipment design objective.
- 6) The system shall meet or exceed the requirements specified in ERT and clause 21 of ERG in accordance with IEC 62278, IEC 62279 and IEC 62280 or equivalent standards for Reliability, Availability, Maintainability and the Safety of signaling equipment.
- 7) The calculation of RAM requirement will take into consideration only relevant failures. A relevant failure of an item is an independent failure which results in a loss of function of that item caused by:
 - a) A fault in equipment or a sub-system while operating within its design and environmental specification limits; or
 - b) Improper operation, maintenance or testing of the item as a result of Contractor supplied documentation;

2.8.2 Reliability Requirements

The Reliability requirements of this ERT shall be subsidiary to the Availability requirements of the applicable specifications. If higher figures are required to achieve the Availability requirements, then these higher figures shall become the Reliability requirements for the ETCS System.

The Reliability measure for the ETCS System shall be Mean Time between Maintenance Action (MTBMA) and Mean Time between Service Affecting Failures (MTBSAF) (delay of 5 minutes or more).

The Train Control System shall achieve a MTBMA in accordance with the following:

- 1) The Contractor shall state the reliability figures of all LRU’s whose failure shall have a potential safety impact to the system;
- 2) The Contractor shall state the reliability figures of all LRU’s whose failure would have a significant impact on the system;
- 3) The Contractor shall state the reliability figures of all failures, which would have a major influence on the system; and
- 4) The Contractor shall state the reliability figures of all failures that would have a minor effect on the system.

An LRU considered as being related to Safety shall be defined through Safety activities. The Contractor shall provide the reliability figures for their particular equipment.

The Contractor shall develop a failure mode and analysis inclusive of an assessment in order to determine which Reliability requirements are applicable for all LRU’s.

proven design, ratified by Independent Safety Assessor and shall have been successfully implemented in transit systems currently in operation.

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- 3) The Contractor shall state the reliability figures of all failures, which would have a major influence on the system; and
- 4) The Contractor shall state the reliability figures of all failures that would have a minor effect on the system.

2.11.8 Degraded Operation Modes

The normal mode of operation for trains shall be ATO.

If a failure of the ATO mode occurs, the ATO-OB shall enter a failure state and a failure indication displayed to the Driver. The train control system shall revert to ATP mode.

A failure of the ATP system shall prevent the train to be driven in ATP Manual mode, reverting to SR Mode. In this mode, the speed of the train shall be limited to 25 km/h.

A complete malfunction of the on-board ATP system will require that the system is overridden. To override the ATP system, a sealed switch shall be provided by the rolling stock contractors. Operation of this switch shall be logged within the TMS and the speed restricted to 25 km/h by the Rolling Stock system.

An indication shall be provided within the train operator cab to indicate the type of degraded mode of operation.

The degraded operation performance requirements shall be demonstrated by the Contractor.

2.11.9 Mode on the depot transfer line

Transition from one level to another shall be smooth and it shall comply SRS 3.6.0 Baseline 3 release 2 or latest issued. Arrangement shall be made to handover the trains from ATP mode to manual mode on the workshop, repair shops, cleaning shop lines and sidings. All movement in the Depot shall be achieved by observance of lineside shunt signals and stop signals, where necessary. The speed in depot is limited to a maximum speed of 25 km/h.

2.11.10 Transition between Modes

The Contractor shall state and describe in detail which transition modes may be achieved automatically and which must be performed manually by the train operator.

This shall be done in accordance with operational moves required for each depot and must be detailed on signaling layout and route tables.

2.12 System Architecture

2.12.1 General Requirements

The achievement of the system architecture and management of the line operation depends upon the fiber optic Communications Network (supplied by the Communications system) which encompasses the whole line and allows bi-directional communication between each sub-system.

The system comprises of the following infrastructure sub-systems; these being:

- 1) ATP (Automatic Train Protection);
- 2) ATO (Automatic Train Operation);
- 2) CBI (Computer Based Interlocking);
- 3) ATS (Automatic Train Supervision);
- 4) RBC (Radio Block Center);

Coupling of trains for call-on or push-out shall normally be performed in SR or OS Mode. Additionally, it shall be able to couple consists together whilst in service. This may be performed at stations, turn-backs or sidings. The train shall then be returned to the depot at the earliest opportunity.

2.11.5 Unauthorized Roll-Back

The ETCS System shall prevent an unauthorized reverse movement of the train by applying the emergency brake after a pre-determined distance.

2.11.6 Reverse Running

It shall be possible to operate trains bi-directionally at main line operational speeds. Full ATP (no ATO will be provided for reverse running) protection shall be provided for bi-directional running on all main line tracks and spur lines. Reverse running shall be performed in the event of the unavailability of any track section, or in an emergency scenario (e.g. derailment, train failure, etc.).

2.11.7 Train Operation Mode

The normal train operation mode is ATO (Automatic mode). For the other operation modes, the Train Operation procedures between modes shall be detailed by the Contractor.

2.11.8 Degraded Operation Modes

The normal mode of operation for trains shall be ATO.

If a failure of the ATO mode occurs, the ATO-OB shall enter a failure state and a failure indication displayed to the Driver. The train control system shall revert to ATP mode.

A failure of the ATP system shall prevent the train to be driven in ATP Manual mode, reverting to SR Mode. In this mode, the speed of the train shall be limited to 25 km/h.

A complete malfunction of the on-board ATP system will require that the system is overridden. To override the ATP system, a sealed switch shall be provided by the rolling stock contractors. Operation of this switch shall be logged within the TMS and the speed restricted to 25 km/h by the Rolling Stock system.

An indication shall be provided within the train operator cab to indicate the type of degraded mode of operation.

The degraded operation performance requirements shall be demonstrated by the Contractor.

2.11.9 Mode ~~when entering a depot~~ on the depot transfer line

Transition from one level to another shall be smooth and it shall comply SRS 3.6.0 Baseline 3 release 2 or latest issued. Arrangement shall be made to handover the trains from ATP mode to manual mode on the workshop, repair shops, cleaning shop lines and sidings. As the train approaches the depot access line, the train operator must manually transfer from ATP (or ATO) mode to manual shunting mode to switch the operational mode. Thereafter, manual operation of the train is performed in the Depot. All movement in the Depot shall be achieved in this mode and by observance of lineside the Depotshunt signals and stop signals, where necessary. In this mode the speed in depot is limited to a maximum speed

GSM-R radio system shall comply to EIRENE SRS 16.00 and FRS 8. The Contractor shall liaise with the relevant authorities for obtaining all necessary approvals of wireless equipment in the proposed frequency band.

The radio design shall be submitted for review by the Engineer before deployment.

The Contractor shall submit their preferred methodology for the positioning of Wayside ATP equipment including RBCs / CBIs, etc. to the Engineer for review.

2.12.8 Diagnostics

The system shall perform internal diagnostics. Internal self-test should be performed every system cycle and should verify the proper operation of CPU hardware and software as well as the health of other system PCB’s. The failure shall be logged.

The system shall have the facility of interfacing with a portable test unit to retrieve data logs and system status information. The Contractor shall provide the portable test unit with the associated software to the Employer.

2.12.9 On-Line Data Logging Facility

The system shall log all events, commands, functions etc. which should be date and time stamped, for enabling complete analysis of safe and proper functioning of the system. The duration of logging shall be for a minimum of 24 hours.

The system shall interface with the on-board Train Management System (TMS) of the Rolling stock for online data logging of all events, commands and functions including on board Train control system failures, operating modes, current track section identification, etc. The duration of logging will be 24 hours.

Event logging facility for minimum 100,000 events shall be provided for the Wayside ATC equipment.

The Contractor shall provide laptop with debugging software for both on-board and wayside ATC equipment for failure diagnosis at site.

The system shall be suitable for working on sections having 1500VDC OCS traction power system and where cars will be propelled by IGBT VVVF controlled three-phase induction motors.

2.12.10 Automatic Train Protection (ATP) System

2.12.10.1 This system shall be a “proven in operation” ETCS fixed block ATP system. The Contractor shall provide substantiated evidence of successful operation on other similar types of Rail systems.

The sub-system shall as a minimum, but not be limited to, the following elements or similar proven equipment:

- 1) European Vital Controller (EVC) which controls the train’s safety-critical and other functions; and
- 2) Radio Block Center (RBC) which supervises trackside equipment data and train positioning throughout the line, which is received from the CBI to provide Movement Authority (MA) to the trains.

The ATC shall comprise of a comprehensive ATP system, which shall perform the following high-level functions:

- 1) The accomplishment of headways as specified in the ERT, with trains being separated on the basis of their real positions plus an additional safety margin. This is made possible by continuous bi-directional track to train communications via the ETCS GSM-R radio system;
- 2) The inclusion of an advanced screen display (DMI) for driving modes, providing enhanced driver assistance functionality;
- 3) The continuous monitoring of trains, including the management of alarms and events, which can be downloaded on a reliable and regular basis;
- 4) The ATC system (ATP) shall safely perform safety-critical functions at SIL-4 level, inclusive of wayside and train-borne equipment; and
- 5) The ATP system shall provide the safety functions when the train is running in ATO mode, the normal mode for train operations.
- 6) When the ATO fails, the train will run in ATP mode. Its functions include supervision of running of train while remaining within the safety envelope calculated by ATP, train speed control, and protection point.

The train doors shall be authorized by the ATC system to be opened once the train reaches the correct stopping point at the station. The ATC system shall execute programmed stops and control, in conjunction with the ATS/ATP equipment, and shall execute dwell times in accordance with the timetable/ headway.

- 7) Automatic Train Protection is considered a “vital” system and shall comply with “fail-safe” principles using state-of-the-art techniques in conjunction with recognized railway standards acceptable to the Employer. The system shall be configured for it and associated subsystems meet availability objectives.
- 8) The ATP system should be modular in design for installation on-board of vehicles, wayside equipment rooms or apparatus enclosures and for ease of replacement in the event of malfunction. The equipment (hardware and software) must be of proven design and application.
- 9) Automatic Train Protection shall be provided on all main line running sections inclusive of turn-back facilities at terminal stations and at specific locations situated on the system. As a minimum, the ATP shall provide the following functions:
 - a) Prevents a train from entering a non-permitted area without invoking an irrevocable emergency brake application;
 - b) Roll back detection;
 - c) Wheel diameter compensation;
 - d) Wheel slip and slide detection; and
 - e) Self-diagnostic and health monitoring.
- 10) The ATP shall also be capable of ensuring observance of temporary or permanent speed restrictions in addition to the provision of safe stopping profiles for all train movements.
- 11) The ATP equipment shall be of fail-safe design with high availability and designed in accordance with Safety Integrity Level 4 (SIL 4) requirements as stipulated in standards indicated in the applicable specifications. The Contractor shall provide valid substantiation of implementation of the proposed system and associated equipment together with references of successful in-service operation on similar

rail networks. This shall be supported by full technical details and description of equipment and system operating philosophy, including failure modes.

- 12) The ATP system design and equipment shall be capable of maintaining a safe braking distance between following trains at all times. The Contractor shall explain in a separate document the method and all parameters adopted for use in the calculation of overlap distances. The braking distances shall assume worst case braking with vehicles crush loaded at AW4, other variables including equipment reaction, poor rail/wheel adhesion and other imprecise characteristics shall also be taken into consideration. The Contractor shall identify and quantify all tolerances and assumptions, the measures adopted in the calculations and their subsequent evaluation and submit them for approval by the Engineer/Employer. The Contractor shall stipulate and provide a copy of any computer-aided simulation software package used for this purpose.
- 13) The design of the signaling system shall be based upon a train-braking rate used by the Rolling Stock.
- 14) The ATP speed profiles are to be determined in conjunction with the signaling interlocking, which shall ensure that sections are unoccupied by vehicles, and points are in the correct position and detected & the route ahead is set and locked.
- 15) The Contractor shall document in detail the effect of ATP wayside transmission failure of single or multiple balises or similar devices as prescribed by the Contractor’s system, and its potential consequences to the safety of the ATP system inclusive of maintaining safe braking distances.

2.12.10.2 Door Opening Authorization in ATP Mode

The ATP system shall prevent unsafe opening of train doors by providing the train with an appropriate control signal when the train has proved to be stationary, with the service brakes applied and the Train is correctly positioned within its designated stopping location (± 500 mm) at a station platform with the train doors aligned with the Platform Screen Doors. The ATP system shall only enable the opening of the Train doors on the side of the Train that is immediately adjacent to the platform edge. To achieve this function, a normal stopping marker board shall be provided to ensure the Train stops within the defined stopping point.

If the train stops within safety conditions for door opening authorization, the ETCS will provide the door enable signal to open the doors on the correct side of the platform. If the train does not stop within the door opening authorization window defined above, the ETCS shall not provide the door enable signal to open the doors on the correct side of the platform.

If the train has stopped outside the door opening authorization window, the System shall provide the Train operator with the following three alternatives:

- 1) To attempt, in ATP mode, to reposition the train in case the train stops short of stopping position subject to a maximum creeping speed of 10 km/h;
- 2) To attempt, in ATP mode, to reposition the train in case the train overrun the stopping position subject to a maximum total reversing distance of 10 m; and
- 3) To proceed to the next station (except terminal station) in ATP Mode in case the train overrun the stopping position more than 10m. In this case, an alarm shall be activated by ATC system to indicate this condition.

It should be noted that this maneuver can only performed in ATP mode and only with the permission of the traffic controller.

A stopped train shall not be permitted to move until all doors (including Platform Screen Doors) of the train are proven closed and locked.

2.12.11 Automatic Train Operation (ATO) System

ATO mode shall be the normal mode of operation.

In ATO mode, the train shall operate without intervention by the train operator except when starting from a station stop. ATO mode shall operate under the supervision and control of the ATP subsystem.

Trains capable of automatic operation shall be entered into service in ATO Mode.

In ATO mode, the ATO function controls the train braking and traction systems under the supervision of the ATP system.

In ATO Mode, the Train Control System shall:

- 1) Accelerate and decelerate the train by applying traction power, coasting, and applying and releasing the brakes;
- 2) Automatically control speed, acceleration, preventing unnecessary braking, stopping and starting;
- 3) Automatically stop the train at the correct stopping point within stations in conjunction with the Platform Screen Door positioning;
- 4) Provide all indications necessary to operate the train;
- 5) Continuously control the speed of the train within the Maximum Safe Speed (MSS) and Movement Authority Limit (MAL);
- 6) Open train doors on the correct side when the train is docked if permitted by the ATP door release command; and
- 7) Prevent the train from starting if train doors are not detected closed.

Train re-starting from a signal stop shall be automatic.

Train starting or re-starting from a station stop shall be initiated by the train operator.

When a train is stationary, the train operator shall apply a Full Service Brake.

The train operator shall have the capability of taking over control of the train any time while degrading the mode appropriately.

2.12.11.1 Station Stopping

In ATO Mode, the Signaling/Train Control System shall ensure that the trains stop within the accuracy specified. A visual indication shall be provided to the train operator when the train has docked.

2.12.11.2 Stopping Position

Stopping Positions shall be provided for each direction of travel and shall be designed to position the train within the parameters indicated below. The train stopping position shall be optimised for platform screen door (PSD) entry/exit locations.

2.12.11.3 Stopping Accuracy

All trains in ATO mode shall have a stopping accuracy within ± 300 mm for 99.95% and ± 500 mm for 99.98% of station stops. When a train is stopped within these tolerances of the

Stopping Position and proved to be stationary, it is said to be “docked”.

2.12.11.4 Train Doors

An enable doors signal shall be provided for train doors, indicating left-side, right-side or both-side, as appropriate for the station, when the following conditions are met:

- 1) The train is stopped within the performance limits; and
- 2) Train speed is lower than 1 km/h.

This signal shall be available to the train within 0.5 s of this condition being achieved.

In ATO Mode, the Signaling/Train Control System shall initiate door opening when the enable doors signal is sent. In ATP Mode, the doors will be opened by the train operator. Provision shall be made for the train operator to prevent door opening in ATO Mode.

2.12.11.5 Cab Side Door Interlock

In ATO Mode only, the train shall be prevented from departing unless all the train cab doors are closed.

2.12.11.6 Not used

2.12.11.7 Permissive Door Operation

The Rolling Stock Contractors shall provide a permissive door button (PDB) in the driver’s console. The permissive door button function (PDB function) shall be possible on the main line as well as in the Depot.

The PDB shall provide the following functionality:

- 1) The PDB when activated shall override the on-board signaling system’s door release signal and shall provide door authorization on either side of the train regardless of the train’s position; and
- 2) In the event of the on-board signaling unit not releasing the train doors at standstill, the permissive door operation shall force authorization on either side of the train door and the train operator can open the selected side train doors.

Train door operation shall be normalized after train doors are closed and locked again.

Activation of the PDB shall be logged by the event recorder.

2.13 Emergency Stop Switches

- 1) These shall be located on each side of each platform. On each platform, there shall be 3 Emergency Stop Switches provided and in the Station Control Room.
- 2) Operation of the switches shall have the following effect:
 - a) If a train’s approach is more than its service braking distance from the platform, it shall stop with a service-brake application;

The system shall interface with the on-board Train Management System (TMS) of the Rolling stock for online data logging of all events, commands and functions including on board Train control system failures, operating modes, current track section identification, etc. The duration of logging will be 24 hours.

Event logging facility for minimum 100,000 events shall be provided for the Wayside ATC equipment.

The Contractor shall provide laptop with debugging software for both on-board and wayside ATC equipment for failure diagnosis at site.

The system shall be suitable for working on sections having 1500VDC OCS traction power system and where cars will be propelled by IGBT VVVF controlled three-phase induction motors.

2.12.10 Automatic Train Protection (ATP) System

2.12.10.1 This system shall be a “proven in operation” ETCS fixed block ATP system. The Contractor shall provide substantiated evidence of successful operation on other similar types of Rail systems.

The sub-system shall as a minimum, but not be limited to, the following elements or similar proven equipment:

- 1) European Vital Controller (EVC) which controls the train’s safety-critical and other functions; and
- 2) Radio Block Center (RBC) which supervises trackside equipment data and train positioning throughout the line, which is received from the CBI to provide Movement Authority (MA) to the trains.

The ATC shall comprise of a comprehensive ATP system, which shall perform the following high-level functions:

- 1) The accomplishment of headways as specified in the ERT, with trains being separated on the basis of their real positions plus an additional safety margin. This is made possible by continuous bi-directional track to train communications via the ETCS GSM-R radio system;
- 2) The inclusion of an advanced screen display (DMI) for driving modes, providing enhanced driver assistance functionality;
- 3) The continuous monitoring of trains, including the management of alarms and events, which can be downloaded on a reliable and regular basis;
- 4) The ATC system (ATP) shall safely perform safety-critical functions at SIL-4 level, inclusive of wayside and train-borne equipment; and
- 5) The ATP system shall provide the safety functions when the train is running in ATO mode, the normal mode for train operations.
- 6) When the ATO fails, the train will run in ATP mode. Its functions include supervision of running of train while remaining within the safety envelope calculated by ATP, train speed control, and protection point.

The train doors shall be authorized by the ATC system to be opened once the train reaches the correct stopping point at the station. The ATC system shall execute programmed stops and control, in conjunction with the ATS/ATP equipment, and shall execute dwell times in accordance with the timetable/ headway.

- 7) Automatic Train Protection is considered a “vital” system and shall comply with ‘fail-safe’ principles using state-of-the-art techniques in conjunction with recognized railway standards acceptable to the Employer. The system shall be configured for it and associated subsystems meet availability objectives.
- 8) The ATP system should be modular in design for installation on-board of vehicles, wayside equipment rooms or apparatus enclosures and for ease of replacement in the event of malfunction. The equipment (hardware and software) must be of proven design and application.
- 9) Automatic Train Protection shall be provided on all main line running sections inclusive of turn-back facilities at terminal stations and at specific locations situated on the system. As a minimum, the ATP shall provide the following functions:
 - a) Prevents a train from entering a non-permitted area without invoking an irrevocable emergency brake application;
 - b) Roll back detection;
 - c) Wheel diameter compensation;
 - d) Wheel slip and slide detection; and
 - e) Self-diagnostic and health monitoring.
- 10) The ATP shall also be capable of ensuring observance of temporary or permanent speed restrictions in addition to the provision of safe stopping profiles for all train movements.
- 11) The ATP equipment shall be of fail-safe design with high availability and designed in accordance with Safety Integrity Level 4 (SIL 4) requirements as stipulated in standards indicated in the applicable specifications. The Contractor shall provide valid substantiation of implementation of the proposed system and associated equipment together with references of successful in-service operation on similar rail networks. This shall be supported by full technical details and description of equipment and system operating philosophy, including failure modes.
- 12) The ATP system design and equipment shall be capable of maintaining a safe braking distance between following trains at all times. The Contractor shall explain in a separate document the method and all parameters adopted for use in the calculation of overlap distances. The braking distances shall assume worst case braking with vehicles crush loaded at AW4, other variables including equipment reaction, poor rail/wheel adhesion and other imprecise characteristics shall also be taken into consideration. The Contractor shall identify and quantify all tolerances and assumptions, the measures adopted in the calculations and their subsequent evaluation and submit them for approval by the Engineer/Employer. The Contractor shall stipulate and provide a copy of any computer-aided simulation software package used for this purpose.
- 13) The design of the signaling system shall be based upon a train-braking rate used by the Rolling Stock.
- 14) The ATP speed profiles are to be determined in conjunction with the signaling interlocking, which shall ensure that sections are unoccupied by vehicles, and points are in the correct position and detected & the route ahead is set and locked.
- 15) The Contractor shall document in detail the effect of ATP wayside transmission failure of single or multiple balises or similar devices as prescribed by the

Contractor’s system, and its potential consequences to the safety of the ATP system inclusive of maintaining safe braking distances.

2.12.10.2 Door Opening Authorization in ATP Mode

The ATP system shall prevent unsafe opening of train doors by providing the train with an appropriate control signal when the train has proved to be stationary, with the service brakes applied and the Train is correctly positioned within its designated stopping location (± 500 mm) at a station platform with the train doors aligned with the Platform Screen Doors. The ATP system shall only enable the opening of the Train doors on the side of the Train that is immediately adjacent to the platform edge. To achieve this function, a normal stopping marker board shall be provided to ensure the Train stops within the defined stopping point.

If the train stops within safety conditions for door opening authorization, the ETCS will provide the door enable signal to open the doors on the correct side of the platform. If the train does not stop within the door opening authorization window defined above, the ETCS shall not provide the door enable signal to open the doors on the correct side of the platform.

If the train has stopped outside the door opening authorization window, the System shall provide the Train operator with the following three alternatives:

- 1) To attempt, in ATP mode, to reposition the train in case the train stops short of stopping position subject to a maximum creeping speed of 10 km/h;
- 2) To attempt, in ATP mode, to reposition the train in case the train overrun the stopping position subject to a maximum total reversing distance of 10 m; and
- 3) To proceed to the next station (except terminal station) in ATP Mode in case the train overrun the stopping position more than 10m. In this case, an alarm shall be activated by ATC system to indicate this condition.

It should be noted that this maneuver can only performed in ATP mode and only with the permission of the traffic controller.

A stopped train shall not be permitted to move until all doors (including Platform Screen Doors) of the train are proven closed and locked.

2.12.11 Automatic Train Operation (ATO) System

ATO mode shall be the normal mode of operation.

In ATO mode, the train shall operate without intervention by the train operator except when starting from a station stop. ATO mode shall operate under the supervision and control of the ATP subsystem.

Trains capable of automatic operation shall be entered into service in ATO Mode.

In ATO mode, the ATO function controls the train braking and traction systems under the supervision of the ATP system.

In ATO Mode, the Train Control System shall:

- 1) Accelerate and decelerate the train by applying traction power, coasting, and applying and releasing the brakes;
- 2) Automatically control speed, acceleration, preventing unnecessary braking, stopping and starting;
- 3) Automatically stop the train at the correct stopping point within stations in conjunction with the Platform Screen Door positioning;
- 4) Provide all indications necessary to operate the train;

- 5) Continuously control the speed of the train within the Maximum Safe Speed (MSS) and Movement Authority Limit (MAL);
- 6) Open train doors on the correct side when the train is docked if permitted by the ATP door release command; and
- 7) Prevent the train from starting if train doors are not detected closed.

Train re-starting from a signal stop shall be automatic.

Train starting or re-starting from a station stop shall be initiated by the train operator.

When a train is stationary, the train operator shall apply a Full Service Brake.

The train operator shall have the capability of taking over control of the train any time while degrading the mode appropriately.

2.12.11.1 Station Stopping

In ATO Mode, the Signaling/Train Control System shall ensure that the trains stop within the accuracy specified. A visual indication shall be provided to the train operator when the train has docked.

2.12.11.2 Stopping Position

Stopping Positions shall be provided for each direction of travel and shall be designed to position the train within the parameters indicated below. The train stopping position shall be optimised for platform screen door (PSD) entry/exit locations.

2.12.11.3 Stopping Accuracy

All trains in ATO mode shall have a stopping accuracy within ± 300 mm for 99.95% and ± 500 mm for 99.98% of station stops. When a train is stopped within these tolerances of the Stopping Position and proved to be stationary, it is said to be “docked”.

2.12.11.4 Train Doors

An enable doors signal shall be provided for train doors, indicating left-side, right-side or both-side, as appropriate for the station, when the following conditions are met:

- 1) The train is stopped within the performance limits; and
- 2) Train speed is lower than 1 km/h.

This signal shall be available to the train within 0.5 s of this condition being achieved.

In ATO Mode, the Signaling/Train Control System shall initiate door opening when the enable doors signal is sent. In ATP Mode, the doors will be opened by the train operator. Provision shall be made for the train operator to prevent door opening in ATO Mode.

2.12.11.5 Cab Side Door Interlock

In ATO Mode only, the train shall be prevented from departing unless all the train cab doors are closed.

2.12.11.6 ~~Not used Door Opening Authorization in ATP Mode~~

~~The ATP system shall prevent unsafe opening of train doors by providing the train with an appropriate control signal when the train has proved to be stationary, with the service brakes applied and the Train is correctly positioned within its designated stopping location (± 500 mm) at a station platform with the train doors aligned with the Platform Screen Doors. The ATP system shall only enable the opening of the Train doors on the side of the Train that is immediately adjacent to the platform edge. To achieve this function, a normal stopping marker board shall be provided to ensure the Train stops within the defined stopping point.~~

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~~If the train has stopped outside the door opening authorization window, the System shall provide the Train operator with the following three alternatives:~~

- ~~1) To attempt, in ATP mode, to reposition the train in case the train stops short of stopping position subject to a maximum creeping speed of 10 km/h;~~
- ~~2) To attempt, in ATP mode, to reposition the train in case the train overrun the stopping position subject to a maximum total reversing distance of 10 m; and~~
- ~~3) To proceed to the next station (except terminal station) in ATP Mode in case the train overrun the stopping position more than 10m. In this case, an alarm shall be activated by ATC system to indicate this condition.~~

~~It should be noted that this maneuver can only performed in ATP mode and only with the permission of the traffic controller.~~

~~A stopped train shall not be permitted to move until all doors (including Platform Screen Doors) of the train are proven closed and locked.~~

2.12.11.7 Permissive Door Operation

The Rolling Stock Contractors shall provide a permissive door button (PDB) in the driver’s console. The permissive door button function (PDB function) shall be possible on the main line as well as in the Depot.

The PDB shall provide the following functionality:

- 1) The PDB when activated shall override the on-board signaling system’s door release signal and shall provide door authorization on either side of the train regardless of the train’s position; and
- 2) In the event of the on-board signaling unit not releasing the train doors at standstill, the permissive door operation shall force authorization on either side of the train door and the train operator can open the selected side train doors.

Train door operation shall be normalized after train doors are closed and locked again.

Activation of the PDB shall be logged by the event recorder.

2.13 Emergency Stop Switches

- 1) These shall be located on each side of each platform. On each platform, there shall be 3 Emergency Stop Switches provided and in the Station Control Room.

The layout of Workstations shall take account of maintenance access requirements. Workstations shall be safe, taking account of electrical safety, stability and heat conduction.

The design of workstation-mounted display equipment shall take account of the greater viewing distances to be found in Control Rooms when operating with multiple displays, compared with workstations where a single monitor is used.

Workstation design shall be suitable for right and left-handed users.

When using one-handed control devices, there shall be adequate workstation space and cabling facilities to place devices to the left or right of the user.

Seats shall, as a minimum, meet requirements for the type of task required to be performed.

Workstations shall take into account the needs of employees with disabilities, where appropriate.

Human abilities, characteristics, limitations, skills and task needs shall be taken into account when designing the human-machine interface (HMI).

The operator shall at all times be the highest authority in the human-machine interface with the exception of when in automatic mode. However, the operator may take manual control at any time.

The user shall at all times be provided with the necessary information such that they are able to have a comprehensive and robust understanding of the system and its associated sub-systems. All workstations, printers, voice and data facilities within the OCC shall be provided the Contractor.

2.18.6 Control Room Design, Materials Finishes and Facilities

The Depot Contractor shall be responsible for the supply and installation of all finishes and MEP services in the Control Room.

2.19 Depot

Depots shall be provided for the overall system at Banlic (South Depot) and Mabalacat (North Depot). The Depot shall be under the control of a Depot controller located within the OCC. Additionally, the yard master room has been provided in the Depot for visual monitoring of trains and vehicles movement and to operate the point machine manually, if required. However, the departure movement of trains from the Depot into revenue service shall be achieved at the Depot transfer track using Automatic Route Setting (ARS) in conjunction with the timetable.

2.19.1 Manual Route Setting within the Depot

In the event the automatic route setting is unavailable for departure from the Depot, the Depot Controller shall be capable of setting routes into and out of the Depot manually.

The Manual control of equipment within the Depot includes, but shall not be limited to the following:

- 1) Route setting and cancelling, route barring and releasing;
- 2) Switch setting Normal and Reverse, switch blocking and unblocking;

Philippine female to 95th percentile Philippine male.

Workstation design shall consider the five postures commonly adopted by Control Room Operators:

- 1) Bent forwards;
- 2) Erect;
- 3) Relaxed;
- 4) Reclined; and
- 5) Standing.

The layout of Workstations shall take account of maintenance access requirements. Workstations shall be safe, taking account of electrical safety, stability and heat conduction.

The design of workstation-mounted display equipment shall take account of the greater viewing distances to be found in Control Rooms when operating with multiple displays, compared with workstations where a single monitor is used.

Workstation design shall be suitable for right and left-handed users.

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- 3) Maintenance blocking and unblocking;
- 4) Traffic direction set and cancelling (into and out of Depot);
- 5) If manual route setting is requested and the route is not set within a predefined time, the route setting is cancelled, and an alarm is raised to inform the Depot Controller of the unsuccessful route request;
- 6) When a route cancellation is requested, the route shall automatically be released if no train has entered the approach locking area. However, if a train has entered the approach locking area, then the route shall cancel after a pre-defined time-out. This shall be represented specifically on the Depot HMI;
- 7) When a route is set, the system shall automatically release the route after the passage of a train on that route (TORR);
- 8) The route shall be released when the train has cleared the switch area. Additionally, the system shall automatically release switches upon the passage of the train that may be involved in that route; and
- 9) The system shall allow the Train Controller to activate a route cancellation request or by an auto route cancellation request through different commands (by screen touch, mouse or keyboard command). The cancellation of an already interlocked route shall not be allowed while there are trains in the route area unless predetermined interlocking rules have been fully satisfied.

The system shall ensure that every control and indications are updated in accordance with equipment response times by transmitting the latest status of wayside equipment to the interlocking system. If control has failed, the system raises an alarm to the Depot Traffic Controller.

The Depot design shall provide for transition of ETCS application levels, whilst entering or leaving the Depot on the transfer track. It shall be the responsibility of the Contractor to provide all of the design, manufacture, installation, testing, and commission of the Signaling apparatus to be installed in the Depot.

Train detection within the Depot shall be achieved using either axle counters or single rail track circuits. This will eliminate the use of impedance bonds. However, broken rail detection will not be available; this can be mitigated by the fact that the speed of the train within the Depot is low (25 km/h) and no passengers are on board the vehicle.

Shunt and buffer stop signals, route indicators shall be rugged, reliable, aesthetic, of proven industrial quality and design, and be of the high-performance LED type in accordance with International Standards. The Contractor shall submit a copy of standards and specifications for review of the Engineer. Route indicators (if used) shall be of the LED type and shall be constructed not to infringe the structure gauge.

The switch machine within the Depot shall be of the trailable type and electrically driven and shall preferably adopt the commercially available power supply where possible. The switch machine shall be immune to the traction power supply inclusive of stray and fault currents.

The Contractor shall supply balises to ensure low speed approach to buffer stops and ensure that the trains shall stop before the buffer stop.

2.19.2 Depot Test Track

Equipment for test tracks within the MCRP North Depot shall be provided as part of the Train Control System.

conjunction with the timetable.

2.19.1 Manual Route Setting within the Depot

In the event the automatic route setting is unavailable for departure from the Depot, the Depot Controller shall be capable of setting routes into and out of the Depot manually.

The Manual control of equipment within the Depot includes, but shall not be limited to the following:

- 1) Route setting and cancelling, route barring and releasing;
- 2) Switch setting Normal and Reverse, switch blocking and unblocking;
- 3) Maintenance blocking and unblocking;
- 4) Traffic direction set and cancelling (into and out of Depot);
- 5) If manual route setting is requested and the route is not set within a predefined time, the route setting is cancelled, and an alarm is raised to inform the Depot Controller of the unsuccessful route request;
- 6) When a route cancellation is requested, the route shall automatically be released if no train has entered the approach locking area. However, if a train has entered the approach locking area, then the route shall cancel after a pre-defined time-out. This shall be represented specifically on the Depot HMI;
- 7) When a route is set, the system shall automatically release the route after the passage of a train on that route (TORR);
- 8) The route shall be released when the train has cleared the switch area. Additionally, the system shall automatically release switches upon the passage of the train that may be involved in that route; and
- 9) The system shall allow the Train Controller to activate a route cancellation request or by an auto route cancellation request through different commands (by screen touch, mouse or keyboard command). The cancellation of an already interlocked route shall not be allowed while there are trains in the route area unless predetermined interlocking rules have been fully satisfied.

The system shall ensure that every control and indications are updated in accordance with equipment response times by transmitting the latest status of wayside equipment to the interlocking system. If control has failed, the system raises an alarm to the Depot Traffic Controller.

The Depot design shall provide for transition ~~for switching into and out of ETCS application levels, of ATP mode from the Depot operation mode~~, whilst entering or leaving the Depot on the transfer track. It shall be the responsibility of the Contractor to provide all of the design, manufacture, installation, testing, and commission of the Signaling apparatus to be installed in the Depot.

Train detection within the Depot shall be achieved using either axle counters or single rail track circuits. This will eliminate the use of impedance bonds. However, broken rail detection will not be available; this can be mitigated by the fact that the speed of the train within the Depot is low (25 km/h) and no passengers are on board the vehicle.

Shunt and buffer stop signals, route indicators shall be rugged, reliable, aesthetic, of proven industrial quality and design, and be of the high-performance LED type in accordance with International Standards. The Contractor shall submit a copy of standards and specifications for review of the Engineer. Route indicators (if used) shall be of the LED type and shall be

to MMSP’s OCC and DCC located in MMSP Depot. The Contractor may connect ETCS test track infrastructure to the central facilities for switching, certification, validation etc., available at OCC/IOCC at North Depot (at Clark) of NSCR line via Optical Fiber back bone.

4. The Contractor shall also interface with MMSP ‘s Civil Depot contractor for the requirement of space and power for ETCS and GSM-R infrastructure.
5. The overall scheme shall be submitted to the Engineer for approval.
6. The Contractor shall identify and supply the testing and diagnostics equipment for the ETCS Test Track and NS01 On Board Signaling and Telecommunication equipment on MMSP trains needed by the MMSP operator for the downloading logs, diagnostics of equipment, testing of Signaling and Radio equipment, and propose these sets of equipment to the Engineer for approval.

2.26.10.3 The Contractor shall also interface with the O&M Concessionaires for NSCR and MMSP Lines for effective interfacing with the MMSP project and propose solutions to the Engineer to obtain Notice of No Objection.

2.26.10.4 The Contractor will make all such arrangements within the contract price and no separate payment shall be made for the above-mentioned works; all associated costs shall be included in the CP NS 01 Contractor’s bid.

2.27 Installation

2.27.1 Construction and Installation Plan

The Contractor shall submit a Construction and Installation Plan for the review of the Engineer. Activities shall be categorized as such that all works that are considered significant will require separate method statements outlining how the work will be carried out safely and risk assessments.

The Contractor shall provide their installation specifications, which shall ensure that installation work and quality conform to best-accepted railway Signaling practices. The installation specifications shall be submitted to the Engineer for their review.

Special attention shall also be paid to all equipment whose correct functioning is essential to the safe and efficient operation of the railway. In particular, the Contractor shall comply with the following requirements:

- 1) Tail cables running to the trackside equipment shall not be jointed;
- 2) All trackside equipment shall be installed sufficiently clear of the high voltage and heavy current equipment so that maintenance risk is reduced to a minimum;
- 3) All trackside equipment shall be installed clear of any stair or door access;
- 4) All trackside equipment shall be installed not to cause any infringement to the schedule of fixed and moving dimensions;
- 5) Trackside equipment such as disconnection boxes, etc. shall be installed at appropriate locations for ease of maintenance;
- 6) Appropriate fixed means of access shall be provided for easy and safe maintenance of Trackside equipment;

2.26.10.2 The ETCS Test Track at MMSP Depot:

1. The Contractor shall design, install, test, and commission the ETCS Test Track on the MMSP Depot (at Valenzuela). This ETCS Test Track is required and will be used by the MMSP operators to test the ETCS onboard equipment with MMSP rolling stock.
2. To achieve this requirement and its objective, the Contractor shall interface with the CP106 Contractor for the shared Test Track infrastructure. MMSP’s test track will be equipped with a CBTC test setup by CP106 contractor as part of their Rolling Stock test for their Signaling system.
3. The requirements for the ETCS Test track are to set up to install, test, and commission the wayside equipment, and to arrange the switching over mode from CBTC to ETCS and vice-versa. The Contractor shall extend alarms and warnings to MMSP’s OCC and DCC located in MMSP Depot. The Contractor may connect ETCS test track infrastructure to the central facilities for switching, certification, validation etc., available at OCC/IOCC at North Depot (at Clark) of NSCR line via Optical Fiber back bone.
4. The Contractor shall also interface with MMSP ‘s Civil Depot contractor for the requirement of space and power for ETCS and GSM-R infrastructure.
5. The overall scheme shall be submitted to the Engineer for approval.
6. The Contractor shall identify and supply the testing and diagnostics equipment for the ETCS Test Track and NS01 On Board Signaling and Telecommunication equipment on MMSP trains needed by the MMSP operator for the downloading logs, diagnostics of equipment, testing of Signaling and Radio equipment, and propose these sets of equipment to the Engineer for approval.

~~6.~~

2.26.10.3 The Contractor shall also interface with the O&M Concessionaires for NSCR and MMSP Lines for effective interfacing with the MMSP project and propose solutions to the Engineer to obtain Notice of No Objection.

2.26.10.4 The Contractor will make all such arrangements within the contract price and no separate payment shall be made for the above-mentioned works; all associated costs shall be included in the CP NS 01 Contractor’s bid.

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The Contractor shall submit a Construction and Installation Plan for the review of the Engineer. Activities shall be categorized as such that all works that are considered significant will require separate method statements outlining how the work will be carried out safely and risk assessments.

The Contractor shall provide their installation specifications, which shall ensure that installation work and quality conform to best-accepted railway Signaling practices. The installation specifications shall be submitted to the Engineer for their review.

All defects and shortfalls in the Contractor’s system discovered in the course of Integrated Testing and Commissioning shall be corrected and retested to the satisfaction of the Engineer before the dates of correct Trial Operations for service trials.

The Contractor shall be responsible for Integrated Testing and Commissioning of the train-borne ATC equipment in cooperation with the Rolling Stock Contractors.

2.33.13 Static Tests

- 1) ATC faults to activate the alarms;
- 2) The Train’s Emergency Brake Relays (EBR) and Zero Velocity Relays (ZVR) tripping (if used);
- 3) Checking of antenna (ATP and Radio) signal strength; and
- 4) Other tests necessary for the safe and proper operations of the train before the Dynamic test.

2.33.14 Dynamic Tests

Dynamic tests shall be performed on a section-by-section basis. Dynamic tests shall, as a minimum, demonstrate the following:

- 1) ATP data transmission and track to train transmission link and vice-versa and Interface between on-board ATC and trackside equipment;
- 2) ATO data transmission tests: ATO-OB to ATO-TS, ATO-OB to ETCS-OB
- 3) Correct interface between track and train equipment up to the Civil Speed Limit;
- 4) Ability of the ETCS System to stop the train within the allowed safety distances from Civil Speed Limit;
- 5) Correct operation of the ETCS System in all modes;
- 6) Verify the speed profile attained against the speed profile received;
- 7) Verify that the train stops within the designated braking distance for various speeds;
- 8) Verify that the audio-visual warnings are activated and brakes are applied, if required when the maximum safe speed is exceeded;
- 9) Verify the activation of EBR and ZVR under required conditions;
- 10) Verify the train stopping accuracy with respect to station stops;
- 11) Verify that the train doors open at the correct side of the train when stopped at station; and
- 12) Verification of the signaled headway.

Low speed dynamic tests shall be carried out on the Depot test tracks and the Main Line where available and as appropriate.

High-speed dynamic tests shall be carried out in maintenance block (where applicable).

The Contractor shall submit the test specifications and procedures for integration of all subsystems of ETCS System with the Communications system for review and acceptance by the Engineer such as:

The checking of System operation under partial fault condition e.g., computer changeover to hot standby or alternative routing capability of remote-control system.

Check that equipment response time complies with specified requirements.

2.33.12 Integrated Testing and Commissioning

On completion of testing and commissioning of the Contractor’s own system to the satisfaction of the Engineer, the Contractor shall carry out all tests necessary to integrate the ERTMS / ETCS Level 2 System with all other systems such as Rolling Stock, Track, Communications, etc. and demonstrate correct operation of all internal and external interfaces.

The Integrated Testing and Commissioning Plan containing the schedule of integrated tests in coordination with the other designated contractors and test procedures shall be submitted to the Engineer for review and acceptance in accordance with the applicable specifications. The tests shall be carried out in coordination with the relevant Designated contractors.

The Contractor shall be required to lead in certain Integrated Testing and Commissioning where such tests are required to prove the performance of system provided by the Contractor.

All defects and shortfalls in the Contractor’s system discovered in the course of Integrated Testing and Commissioning shall be corrected and retested to the satisfaction of the Engineer before the dates of correct Trial Operations for service trials.

The Contractor shall be responsible for Integrated Testing and Commissioning of the train-borne ATC equipment in cooperation with the Rolling Stock Contractors.

2.33.13 Static Tests

- 1) ATC faults to activate the alarms;
- 2) The Train’s Emergency Brake Relays (EBR) and Zero Velocity Relays (ZVR) tripping (if used);
- 3) Checking of antenna (ATP and Radio) signal strength; and
- 4) Other tests necessary for the safe and proper operations of the train before the Dynamic test.

2.33.14 Dynamic Tests

Dynamic tests shall be performed on a section-by-section basis. Dynamic tests shall, as a minimum, demonstrate the following:

- 1) ATP data transmission and track to train transmission link and vice-versa and Interface between on-board ATC and trackside equipment;
- 2) ATO data transmission tests: ATO-OB to ATO-TS, ATO-OB to ETCS-OB
- 3) Correct interface between track and train equipment up to the Civil Speed Limit;
- 4) Ability of the ETCS System to stop the train within the allowed safety distances from Civil Speed Limit;
- 5) Correct operation of the ETCS System in all modes;

- 65) Verify the speed profile attained against the speed profile received;
- 76) Verify that the train stops within the designated braking distance for various speeds;
- 87) Verify that the audio-visual warnings are activated and brakes are applied, if required when the maximum safe speed is exceeded;
- 98) Verify the activation of EBR and ZVR under required conditions;
- 109) Verify the train stopping accuracy with respect to station stops;
- 110) Verify that the train doors open at the correct side of the train when stopped at station; and
- 124) Verification of the signaled headway.

Low speed dynamic tests shall be carried out on the Depot test tracks and the Main Line where available and as appropriate.

High-speed dynamic tests shall be carried out in maintenance block (where applicable).

The Contractor shall submit the test specifications and procedures for integration of all subsystems of ETCS System with the Communications system for review and acceptance by the Engineer such as:

- 1) Fiber Optic Transmission System;
- 2) Passenger Information Display System (PIDS);
- 3) Public Address System (PA System);
- 4) Train Radio Communication System; and
- 5) Master Clock System.

All necessary tests shall be performed for fulfilling interface requirements with other systems such as Track, Traction systems etc. for the purpose of integrated testing and commissioning.

2.33.15 Trial Operations

On completion of the Integrated Testing and Commissioning to the satisfaction of Engineer and System Acceptance Test, the Contractor shall confirm in writing to the Engineer that the works provided by them under the Contract is suitable and ready for the purpose of Trial Operations. During trial operations, the relevant system wide Contractors will run trains and simulate the operating condition of the Railway system.

The objective of Trial Operations is to ensure that the functions and operations of the various systems are satisfactorily integrated and shall be conducted in accordance with the General Requirements.

2.34 Reporting

2.34.1 Failure Report Forms

All failures shall be recorded on a failure report form which shall contain as a minimum the following information:

- 1) Identification of the equipment, including nomenclature, serial number, manufacturer's part number and location;
- 2) Operating time of each system including each shut-down and its cause;

12 INTEGRATED OPERATIONAL CONTROL CENTER AND DEPOT CONTROL CENTER

12.1 Introduction

12.1.1 The complete E & M systems for the Clark International Airport to Calamba line will ultimately be controlled from an Integrated Operations Control Center (IOCC) located at Mabalacat Depot provided by the Contractor. The contractor shall take the lead in the interface of the IOCC. The existing OCC theatre at Mabalacat will be designed and upgraded to IOCC. Therefore, the Mabalacat OCC shall be designed keeping in view the future requirement of IOCC and adequate provision for all facilities will be provided from the beginning for use of the Mabalacat theatre as IOCC at later stage.

As the railway is progressively commissioned, the various control and monitoring functions will be implemented from individual OCC’s and then ultimately migrated to the IOCC as follows:

- i) NSCR will initially be controlled from an OCC at Malanday Depot in Valenzuela,
- ii) MCRP will initially be controlled from the OCC at Mabalacat Depot.
- iii) NSRP – South will initially be controlled from an OCC at Banlic.

The control of system from Malolos to Solis which is controlled from the OCC within Malanday Depot will eventually be transferred to the Integrated Control Center (IOCC) located in Mabalacat Depot, The Contractor shall allow provision for the seamless switchover of control from the OCC in Malanday to the Integrated Operation Control Center. The Contractor shall submit in their design how this will be achieved in coordination with the NSCR E&M System Contractor.

12.1.2 Each Depot (Mabalacat and Banlic) shall have its own Depot Control Center (DCC). The Contractor shall provide E&M facilities in the Depot for efficient operations and management.

12.2 Scope of Works

12.2.1 The Contractor shall combine and consolidate all E&M railway control systems along the route between New Clark City, Clark, and Calamba to allow central control of the line from the IOCC at Mabalacat. which includes:

1. An Integrated ATS and OCC to unify the operational control and monitoring of the three lines N1, N2 and SC
2. Power Supply monitoring and control
3. Passenger Information Displays and PA system
4. Centralized Radio Management and dispatcher for complete line
5. Centralized alarms for disaster management
6. Common video wall to cover display of track layout with train status, Power SCADA and CCTV
7. Centralized trackside alarms management
8. NMS for all subsystems
9. Suitable positions and seating arrangement for all IOCC functions
10. Centralized CMMS
11. Also included to be integrated are systems outside of the E&M systems like BMS which uses the Backbone Transmission Network. The Contractor shall integrate the Central BMS which is provided by other contractors that resides in each OCC for N1, N2, and SC shall

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- 12.7** Each Depot (Mabalacat, Malanday, and Banlie) (Malanday Depot and DCC provided by others) shall have its own Depot Control Center (DCC) where the train movements in each Depot shall be controlled. For that purpose, each DCC shall have as a minimum:
- i) Visibility on location and schedule (including any delays) of trains on the mainline;
 - ii) Depot/Mainline Transfer Track;
 - iii) Depot train control terminal;
 - iv) Depot OCS power control/P-SCADA functions;
 - v) CCTV monitoring;
 - vi) Radio Communication facilities;
 - vii) Telephone communications including a direct line to the Integrated OCC; and
 - viii) Network Management System (NMS)

End of Section

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End of Section

MSN	Multi Services Network
MTBF	Mean Time Between Failures
MTTR	Mean Time to Repair
NAS	Network Attached Storage
NEMA	National Electrical Manufacturers Association
NEXT	Near End Cross Talk
NFPA	National Fire Protection Association
NMS	Network Management System
NSCR	North-South Commuter Rail
NTC	National Telecommunications Commission
NTP	Network Time Protocol
NVMS	Network Video Management System
NVRS	Network Video Recording System
OAM&P	Operational, Administration, Maintenance, and Provisioning
OCC	Operations Control Center
ODF	Optical Distribution Frame
OFC	Optical Fiber Cable
OSI	Open System of Interconnection
PA	Public Address
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services
PAS	Public Address System

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Standard	Series	Details
IEC	605215	Tests device to verify protection against spraying and splashing water
	60571	Railway applications – Electronic equipment used on rail vehicles
	60721	Railway applications – Electronic equipment used on rail vehicles
	60754	Test on gases evolved during combustion of materials from cables
	60794	Optical fiber cable
	60849	Sounds systems for emergency purposes
	62040	Uninterruptible power systems (UPS)
	62236	EMC Directive- Railway applications - Electromagnetic compatibility
	62278	Railway Applications Specifications and Demonstration RAMS
	62305	Protection against lightning
NFPA	Article 70, 130	National Fire Protection Association – Standard for Fixed Guideway Transit and Passenger Rail Systems.
IEEE	802	Standard about local area network among the IEEE standards
	802.11ac	IEEE Standard for Information technology-- Telecommunications and information exchange between systems—Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications--Amendment 4: Enhancements for Very High Throughput for Operation in Bands below 6 GHz.
ITU-T	G series	Transmission system and media, digital systems and networks
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	I series	Integrated services digital network
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All audio recordings shall comply with ISO 3901: International Standard Recording Code or an equivalent standard.

The PA system shall be capable of automatically delivering at least 100 individual prerecorded vocal messages to public areas, offices, equipment rooms, and pre-defined broadcasting zones.

Manual announcement initiated by an operator shall be possible at all times and shall override automatic announcements.

The PA system shall be able to receive, amplify and distribute background music, pre-recorded messages, or live announcements that originate from the local control room, dependent on architectural layout, control points shall be provided on platforms.

The PA system shall be segregated into various zones to accommodate the intended operation. As a minimum, zones shall be provided for public areas of the access levels (including the entrances and the emergency stairs), concourses, and each platform.

The design and installation of the PA system shall not preclude the addition of further zones for extension of the access area coverage into retail areas, where such retail areas exist.

Under hazardous conditions such as a fire, the PA system shall be an important means to assist in evacuation and crowd control. For this reason, the PA-system shall be compliant to the relevant NFPA standards for evacuation communication.

All evacuation routes, including all normally out of bounds to the public, areas, staircases, and corridors shall be covered by the PA system.

The PA coverage shall also be provided for all non-public areas where personnel may be located during their normal duties, including the station control room, ticket office(s), cash office, and staff rooms.

Zone selection shall be dependent upon the origin of the PA transmission:

- From the PA console located in the station control room, announcements shall be capable of being made to one or any combination of zones; and
- From a Controller Workstation located in the OCC, announcements shall be capable of being made to any combination of zones in any number of locations.

All local control room PA control consoles and panels shall incorporate a microphone, zone selection as appropriate to the application, and a non-latching "press to talk switch".

Zone selection shall revert to “no zone selected” after a programmable delay after the PTT button has been pressed (or re-pressed) and released.

The PA control consoles shall allow the manual selection of stored pre-recorded messages to be broadcast to a selected zone or zones.

The PA system shall also permit pre-recorded messages to be triggered automatically according to a user-configured schedule or time interval.

The number of pre-recorded PA messages shall be sufficient for operational purposes with 50% additional spare capacity for future expansion.

The PA control consoles located in the station control rooms shall also incorporate industry-standard input sockets and controls to enable music to be fed into the PA system from proprietary audio equipment. This input shall be capable of being permanently selected to allow continuous broadcasting.

Activation of a pre-recorded, automatic, or live message shall automatically suppress the continuous music broadcast.

of the PA speakers based on an audio simulation, to guarantee a good quality sound in all areas.

The Contractor shall install the speaker in each lift. Cabling from the lift car to terminals in the lift machine room is provided by the Contractors.

Automatic announcements shall be in English and Filipino.

The Public Address (PA) system shall be capable of interfacing with the Passenger Information Display System (PIDS) to provide announcements that are consistent with the Passenger Information Display System in an emergency or abnormal situation.

The PA system shall comply with the requirements of ISO 9921:2003 or an equivalent standard.

The PA system shall be capable of general message broadcasting and also of broadcasting emergency messages.

The hardware and software of the PA system shall be of modular design to allow easy expansion of the system. Expansion of input and output ports for the amplifier switching equipment shall be achieved by the simple addition of plug-in cards or modules.

All equipment shall be of modern design, fully electronic, modularly constructed, and with proven field performance.

The amplifier switching equipment shall use solid-state switches. No relays or reed switches shall be used in this equipment.

Amplifiers and automatic noise control and sensing devices to achieve optimum sound pressure levels shall be provided.

Noise sensing shall be installed to detect the ambient noise where the background noise varies considerably.

All audio recordings shall comply with ISO 3901: International Standard Recording Code or an equivalent standard.

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1. INTRODUCTION

1.1 General

This Chapter specifies the technical characteristics of the Closed-Circuit Television (CCTV) System of the Telecommunications System.

1.2 Overview of the Closed-Circuit Television (CCTV) System

The system provides monitoring and surveillance inside and outside the railway building and related facilities. Camera images can be viewed in each station from the Station Master Control room and the OCC. Depending on their location, cameras can be of fixed or Pan/tilt/zoom type, indoor type, or outdoor type.

The Video recorder shall have a sufficient capacity of at least, one (1) month with high-quality images.

On each platform, a monitor will be installed, for the train driver to view the boarding and alighting of passengers.

On-board Rolling Stock CCTV systems are not included in this system.

2. SCOPE OF WORKS

2.1 General

The specific requirements on the scope of the works for the Closed-Circuit Television (CCTV) System shall be as specified below.

2.2 Scope of supply for the Closed-Circuit Television (CCTV) System.

2.2.1 System configuration

The CCTV system shall comprise all items of control equipment, software, equipment power supplies, control units, interfaces, equipment cabinets and enclosures, video recorders, monitors, cameras, all cabling to and between respective items, and all cabling to the interface terminations with other systems, accessories, and fittings. These items shall be provided by the Contractor.

The Contractor shall design the station CCTV surveillance system to provide 100% coverage of the following specific areas at all stations. However, the stairs and escalators outside of the station shall provide CCTV coverage to the largest extent possible by installing fixed cameras were necessary for security purposes.

The CCTV Systems shall be compliant with the relevant NFPA standards particularly with NFPA 130 for evacuation coverage and communications.

The location of the CCTV monitors and control panel shall be as follows:

- A CCTV control HMI system shall be provided in the SCR and OCC;
- HMI for the SCR shall consist of a work station with a minimum of one (1) number of LCD monitors of a minimum of 22” and a keyboard with joystick controllers and mouse-keyboard controller
- A CCTV monitor with a minimal size of 40 inches shall be installed on the wall of the SCR. The Contractor shall demonstrate the appropriate size of the screen by simulation and calculation.
- HMI for the appropriate controller in the OCC shall consist of work stations with a minimum of two LCD monitors of a minimum of 22” and a keyboard with joystick controllers and mouse-keyboard controllers. A minimum of 2

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DHCP	Dynamic Host Configuration Protocol
DLT	Direct Line Telephone
DMO	Direct Mode Operation
DNP	Defect Notification Period
DTN	Delay Tolerant Network
DTS	Data Transmission System
DTMF	Dual Tone Multi-Frequency
DVAS	Digital Voice Announcement System
DVD	Digital Video Disk
DVI	Digital Visual Interface
DVRS	Digital Voice Recording System
EAC	Electronic Access Control
E2E	End to End
EHS	Event Handling System
EIA	Electronic Industries Alliance
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
E&M	Electrical & Mechanical
EPS	Electrical Pipe Shaft
ETSI	European Telecommunication Standards Institute
FAT	Factory Acceptance Test

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EMI	Electro-Magnetic Interference
E&M	Electrical & Mechanical
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The CSS System shall record any events caused by faults, malfunctions, warnings, or alarm information generated automatically by the connected communication equipment.

b) Alarms

Audible alarms shall be provided to alert the operations personnel to alarms requiring immediate action or attention. The audible alarms shall be audible against ambient noise levels.

There shall be three categories of audible alarms easily distinguishable by separate tones or sounds for events classified such as Notification, Warning, and Alarm.

It shall be possible to acknowledge alarms individually or in groups from the alarm display page.

A mute facility shall be provided to reduce, but not silence, the level of volume of the initiated alarm for emergency events after the alarm has been acknowledged.

Silencing of urgent and non-urgent alarms shall occur on alarm acknowledgment.

When the status of an alarm returns to normal condition, a return-to-normal message to this effect shall be generated.

All audible alarms shall be accompanied by a corresponding text message, providing details of the alarm.

When an alarm is initially received a corresponding visual-flashing indicator shall appear on the display. Once the alarm has been acknowledged the flashing indicator shall transfer to a permanent illumination.

In the event of multiple events initiating audible alarms, only one alarm shall be broadcast at any time. The highest category of alarm shall always take priority, even if a lower priority alarm is already being broadcast. Once the higher category has been acknowledged and muted, the next lowest category of alarm shall initiate the alarm broadcast.

To avoid unnecessary and nuisance alarms or alarms generated by testing a facility shall be provided to enable alarm blocking/filtering to inhibit particular or global alarms from any display. Inhibited alarms shall activate an appropriate message, detailing the non-alarmed parameters and the remote terminal units affected.

3.6.3 Data Transmission Lines for the other Railway Systems Facilities

Data transmission lines for the other facility of BMS (including EAC), Power SCADA, Railway Signal, AFC, and CMMS shall be provided with using VLAN and/or independent shared cores on the Backbone System.

The installation demarcation between the Telecommunications system and the other respective railway facility, e.g., Signaling System, Automatic Fare Collection System, etc, shall be set up at the L2 and/or L3 switches in the OCC, CER, or station CERs. For distance ranging equal or more than 60 meters between the CER and Railway facilities which would need to connect to the L3 Switches of the Backbone system, the Telecommunication systems shall provide connection switches necessary to facilitate Backbone Network connections in Railways facilities rooms, location of switches shall be subject to the approval of the Engineer. Down streams after the points shall be the scope of each relevant railway facility.

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The quantity and location of the digital and analog monitoring and operation points shall follow the requirement of each discipline. All the signals of the above shall be converted to the IP protocol by each discipline.

Below is the Summary of Scope:

1) Common

- Applied facility: BMS including EAC, Power-SCADA, AFC, and Railway Signal
- Line: on Backbone (VLAN) for BMS on separate Cores for Power SCADA, AFC, and Railway Signal
- Installation Division: L2/L3 Switches in CER
- Original Data: Analogue and/or Digital
- Transmission Data: Converted to IP Protocol
- Numbers of Point: provided by each facility

2) AFC System

The scope of works for cable laying and cable containment particularly for AFC systems shall include the following but not limited to:

- The Contractor shall install the power cable and communication cable to the AFC equipment.
- Cables shall be installed in locations that pose no danger to passengers and station staff.
- The communication cable shall be installed so that the influence of noise from the power cable is minimized as much as possible.
- Access point shall be installed in the customer service room, AFC rooms, the waiting room, and on the platform for the ticket counter terminals and the mobile terminals.
- The Contractor shall install L2 and/or L3 switches within the station box if the distance between station CERs and station box exceeds 60 meters.

3.6.4 Cable Systems for Communications

All cables installed on any part of the viaducts, buildings, and stations shall be following the Philippine Electrical Code (PEC 2017 Edition) and Philippine Electronics Code. Where such codes do not comprehensively encompass all requirements, appropriate international standards shall be used.

The cable materials shall be of fire-retardant materials as specified in IEC 60332 or an equivalent standard. Where cables are used in confined spaces the insulation and sheath shall be constructed with Low Smoke Zero Halogen (LS0H, LSZH, LSFH, or LSØH) materials. Testing for halogen-free properties shall be following IEC 60754-1 and 60754-2 or an acceptable equivalent.

All cables and their construction inclusive of any testing certification shall be subject to approval by the Engineer.

All outdoor cables shall be armored and should the cables require screening, the braid shall not be less than 80%.

The quantity and location of the digital and analog monitoring and operation points shall follow the requirement of each discipline. All the signals of the above shall be converted to the IP protocol by each discipline.

Below is the Summary of Scope:

1) Common

- Applied facility: BMS including EAC, Power-SCADA, AFC, and Railway Signal
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3.11 Interface Requirement

3.11.1 General

The Contractor shall coordinate with interface contractors, sub-contractors, other rail system suppliers, and outside authorities as well to ensure that communication equipment offered shall satisfactorily comply with the Contractual requirements.

The Contractor shall follow the Interface Requirements of the Telecommunications system as specified in the General and Technical Requirements of the Contract. Detailed interface design and system integration within the Package is the responsibility of the Contractor.

This contract is part of an entire project for the North-South Commuter Railway Project. The contractor shall be responsible for interface with Solis-Malolos Project (NSCR) and incorporate measures for a seamless interface and seamless operation.

After completion of the OCC in Mabalacat as part of MCRP, this OCC in Mabalacat shall become the main OCC from which the whole line (from Clark International Airport to Calamba) shall be operated.

3.11.2 System Interfaces

3.11.2.1 Interface Requirements between Telecommunications Sub-systems

Table 3.11.2.1 Interface requirements between Telecommunications Subsystems

Telecommunications Subsystem	Interface requirements	
Backbone system	Radio system	Voice and Data system
	CCTV system	PID system
	PA system	Time saver and Master clock system
	Telecommunication equipment monitoring system	Meteorological and Seismic monitoring system
	Power supply system	Grounding (Earth)
	Building Management System (BMS) including EAC.	AFC system
	Other if any	
Radio system	Backbone system	Voice system
	Time saver and Master clock system	Telecommunication equipment monitoring system

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	Other if any	
Radio system	Backbone system	Voice system
	Time saver and Master clock system	Telecommunication equipment monitoring system

Telecommunications Subsystem	Interface requirements	
	Power supply system	Grounding (Earth)
	Building Management System (BMS) including EAC	AFC system
	P-SCADA system	Signal System
	Fire alarm system	Other if any
Meteorological and Seismic monitoring system	Backbone system	Time saver and Master clock system
	Telecommunication equipment monitoring system	Power supply system
	Grounding (Earth)	Other if any
Telecommunication equipment monitoring system	Backbone system	Radio system
	Voice and Data system	CCTV system
	PID system	PA system
	Time saver and Master clock system	Meteorological and Seismic monitoring system
	Power supply system	Grounding (Earth)
	Other if any	
Power supply system	Backbone system	Radio system
	Voice and Data system	CCTV system
	PID system	PA system
	Time saver and Master clock system	Meteorological and Seismic monitoring system
	Telecommunication equipment monitoring system	Grounding (Earth)
	Power system	Other if any
Grounding (Earth)	Backbone system	Radio system
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	Power system	Other if any
Grounding (Earth)	Backbone system	Radio system
	Voice and Data system	CCTV system
	PID system	PA system

Item	Interface requirement
	Provides time information received from GPS to the Fire alarm system. POI is an output port of the master clock unit or the Sub-master clock unit.
	Building management system (BMS) including EAC. Provides a communication line (MSN system line) of the BMS system to connect from each station to OCC. POI is a port of L3SW / L2SW installed in the Telecommunication equipment room.
	CCTV system installed by architecture Provides a communication line (MSN system line) of the CCTV system to connect from each station to OCC. POI is a port of L3SW / L2SW installed in the Telecommunication equipment room.

3.11.2.3 Onboard Communication Interface

This Clause describes the requirements for the Telecommunications System / Radio Contractor and the Rolling Stock Contractors.

Both Contractors shall ensure that all requirements of the Specification on interfaces are comprehensively fulfilled. Below is a brief outline of responsibility between the Contractors. The Contractor shall provide an Interface Management Plan.

Table 3.11.2.3 Radio/Rolling Stock Interface

Item	Item Description	By Contractor
1.	Public Address (PA) System to broadcast speech messages to train passengers from the driver’s cab. Facility to broadcast over the train PA System from the Operations Control Center (OCC) with the associated message content relayed to the train via the Train Radio System	Rolling Stock Radio
2.	Passenger emergency intercom to provide audio communication between carriages and the driver’s cab to enable passengers to talk to the driver should an emergency occur within the train carriage. In case the driver does not pick up the passenger emergency intercom, it automatically connects to the OCC, using the onboard radio.	Rolling Stock Radio
3.	Driver’s intercom system to allow full-duplex audio communication between driver’s cabs.	Rolling Stock

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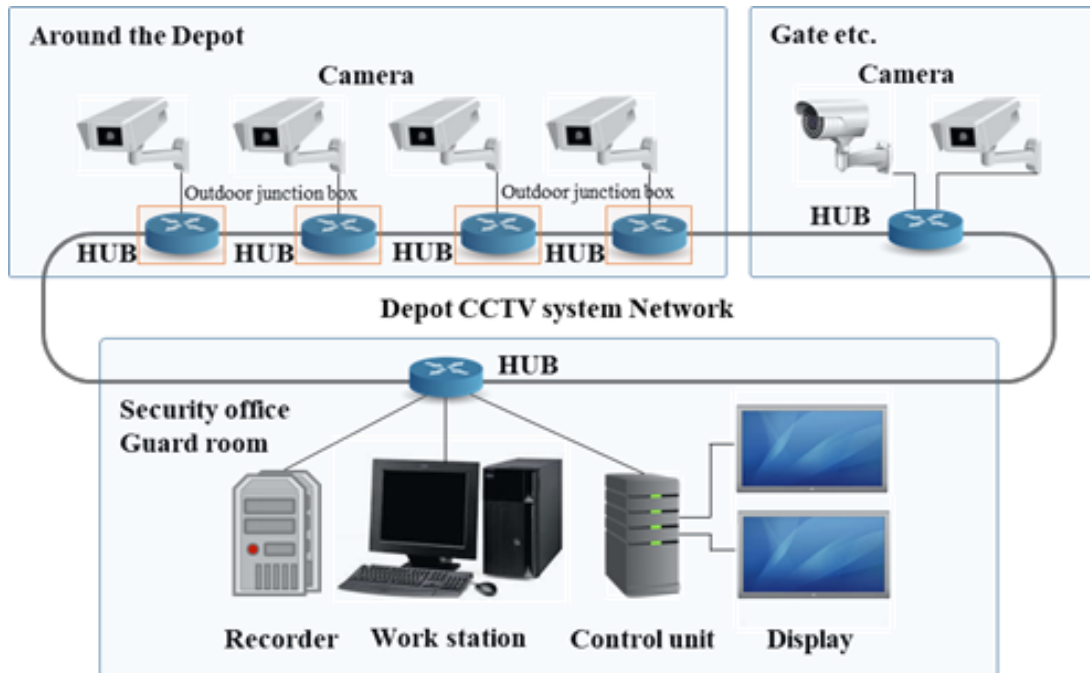


Figure 2.2.2 CCTV system configuration for Depots

2.2.2 System Requirements:

1) CCTV Cameras

- All CCTV cameras shall be of the color CCD type with the low light capability to produce clear and detailed picture quality under high lighting contrast conditions.
- All the CCTV system equipment shall fully conform to the environmental conditions described in the ERG.
- For operational reasons, each CCTV camera shall have a unique identifier.
- The camera data sheets shall be submitted with the Technical Description in the design documents.
- Smoke and Fire detection shall be provided as an early or secondary means of recognition to remote, unmanned equipment rooms with high or significant value, or sensitive equipment.
- The cameras used for the coverage have to be fixed focus cameras and shall cover the designated area with “glare-free” and “not distorted” video streams. PTZ cameras are to be deployed to investigate areas of interest that have been identified by the video coverage of the fixed lens cameras.

The minimum technical specification shall include:

- Camera Type 1
 Fixed cameras in standard outdoor housings equipped with fixed focal length lenses and fixed orientation.
- Camera Type 2
 Fixed cameras in vandal-resistant and dome housings equipped with fixed focal length lenses and fixed orientation.

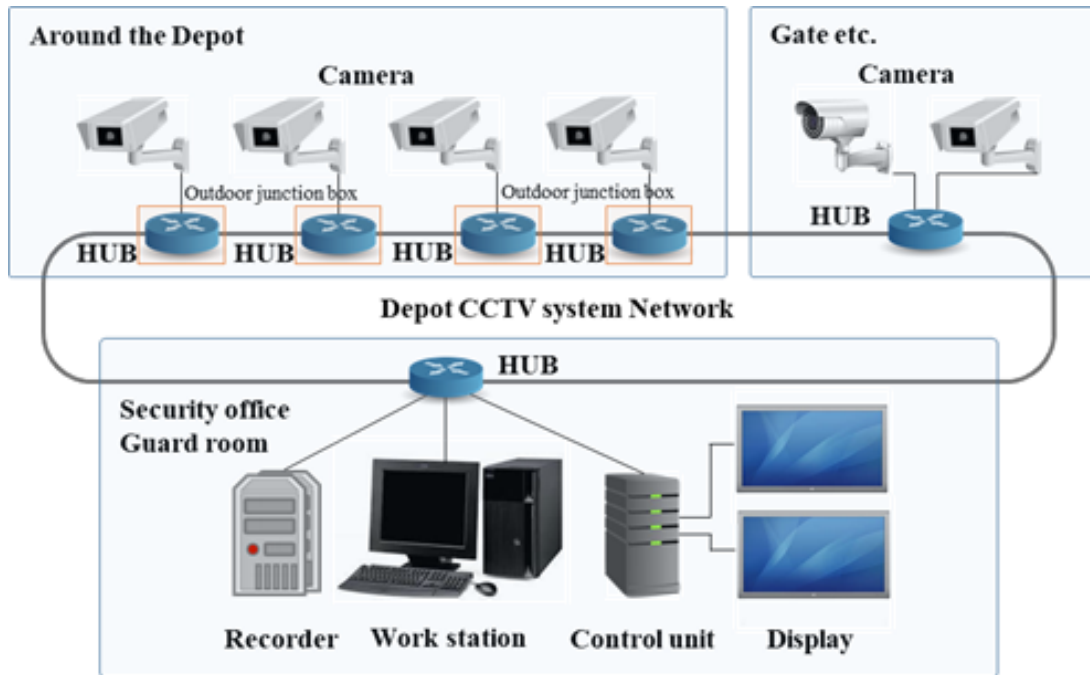


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The minimum technical specification shall include:

- Camera Type 1
 Fixed cameras in standard outdoor housings equipped with fixed focal length lenses and fixed orientation.
- Camera Type 2
 Fixed cameras in vandal-resistant and dome housings equipped with fixed focal length lenses and fixed orientation.

The rule-based configuration detection engine enables applying multiple rules per camera, linking events from multiple cameras and sensors to produce an intelligent, reliable, and comprehensive surveillance picture.

d. Smoke and Fire Detection

In some rooms or areas in the station, depot and along the viaduct, the CCTV cameras shall be able to early and reliably detect smoke and fire and be able to raise an alarm to the CCTV operator especially in remote areas and unmanned rooms.

The areas or rooms that shall be equipped with the fire and smoke detection are as follows, but not limited to:

a.) Stations

- Technical Rooms with sensitive equipment as a secondary detection such as AFC, Signalling, Telecoms Equipment rooms.
- Platforms

b.) Depots

- Unmanned Technical Rooms or with sensitive equipment which a sprinkler system cannot be used such as AFC, Signalling, Telecoms Equipment, Repair and Workshop rooms, and Oil Storage which is highly flammable.

c.) Along the Viaduct

- Remote, unmanned, operation critical and high value auxiliary buildings such as Traction Substation (TSS), Battery Post (BP), Sectioning Post (SP), ISER.

16) Video Recording and Retrieving

The Network Video Recording System (NVRS) shall provide cost-effective local recording, storage, and retrieval facilities at the stations.

Moreover, regarding the local recording system, the main CER shall also have a redundant NVRS for recording any video signals monitored in the OCC.

All recordings shall have the associated camera's unique identifier, time, and date information stamped and superimposed onto the video image. Facilities to recover any recordings using time and/or location requests shall be implemented.

The video recorder shall be capable of operation for 24 hours per day, 365 days per year.

The Contractor shall provide sufficient storage medium to archive a minimum of 7 days of stored recordings for all the cameras in high resolution and a minimum of 30 days of storage in low resolution. The operator shall be able to retrieve, monitor, and playback images from this system without affecting any of the recording functions.

The NVRS shall use Redundant Server Based Network Video Recorders with NAS/RAID storage boxes and DVD burners.

The Contractor shall provide a user-friendly facility for inserting / modifying / detecting at least 10 characters at each input signal to the station switching matrix.

17) Fault and Alarm Management

All alarm statuses of the CCTV system equipment including cameras, video recorders, switches, etc. as necessary shall be monitored by CMSS in the main CER and shall automatically generate an audio/visual alarm on the CMSS/CSS Workstation on the occurrence of an event.

different scenarios as detection of left baggage, passenger falling from an escalator, or attempting to pass through gates illegally.

b. Intrusion Detection

It should be possible to detect and alert when a person enters a protected zone or station area outside of hours. The video analytics system shall be capable of detecting loitering activities and shall have face recognition functionality.

c. Rule-Based Detection

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- 9) All required connectors;
- 10) All necessary fixtures, fittings, and accessories;
- 11) Power supply arrangements and cable, earthing including Termination Protection Devices;
- 12) Communications System Supervisor and storage devices etc., and
- 13) All other cables of different types, including CAT-5, etc.

2.3 Scope of Services

Before the detailed design phase, the Contractor shall compile and submit a loading report to the Engineer that includes details of the required BTS capabilities, the network throughput associated with the different levels of service, and the worst-case transmission delay times.

The Contractor shall compile and submit performance reports to the Engineer for approval. The Contractor shall be responsible where necessary for reconfiguring the network and providing additional hardware if necessary.

3 PERFORMANCE REQUIREMENTS

3.1 General

The design shall be fault-tolerant with protection against failure provided to achieve the system availability. Protection shall include, but not be limited to path diversity, redundancy, and duplication of reliability-critical equipment, component, and circuits.

3.2 Reliability

The inability to perform any required function, the occurrence of unexpected action, or the degradation of the performance below the specifications shall be considered as a failure. The MTBF shall be the average operating time accumulated by the total population of identical items between failures.

3.3 Availability

The availability of the BTS shall be defined as the availability of the circuit between both endpoints of the Backbone Transmission System where the required bandwidth is available for access.

Any circuit of the BTS shall be considered unavailable when:

- There is a loss of communication between endpoints of the circuit; or
- The quality of the signal transmission within the circuit is below the performance standards stipulated in this Technical Requirements.

The Network Management System shall be considered unavailable if any functions provided by the Network Management System cannot be properly exercised. The availability of the Network Management System is provided on ERG 90- ERG 91: Table 21.2 E&M Systems and Track Works RAM Targets.-

3.4 Maintainability Requirements

The Mean Time to Restore (MTTR) of the BTS, its elements, and networking shall be less than four hours (all-inclusive). The service life of the BTS shall not be less than 15 years. The service life of all types of cables shall not be less than 25 years.

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radio and system parameters. Full detail shall be submitted for approval by the Engineer; and

- 7) The Contractor shall produce all design submissions, as-built documents, and drawings under the requirements of the ERG.

2.4 Performance Requirements

Further to the general performance requirements specified of this Technical Requirements, additional performance requirements for the Radio system shall be as specified below.

2.5 Reliability Requirements

The Contractor shall ensure that as a minimum, each of the Radio systems equipment supplied under the Contract complies with the reliability figures herein:

Table 2.5.1 MTBF Figures

Equipment	MTBF (Hours)
Master Site Central control equipment	> 50,000 hours
Base Station Radio	> 80,000 hours
Radio control panel	> 50,000 hours
Mobile radio equipment in train	> 30,000 hours
Hand portable radio	> 25,000 hours
Hand portable radio Chargers	> 25,000 hours
Radio network management system	> 30,000 hours

-2.6 Availability Requirements

In determining the availability of the Radio Systems, reliability block diagrams using field failure rates for commercially available equipment shall be produced. Any degraded mode of operation or re-configuration functions provided by the Radio Systems shall not be included in the determination of the system availability.

The conditions which shall be considered as failures shall include, but not be limited to:

- 1) Failure to initiate an individual call;
- 2) Failure to initiate group call;
- 3) Failure to initiate an emergency call;
- 4) Failure to initiate system call;
- 5) Failure to perform dynamic re-group set-up;
- 6) Failure of any one base station;
- 7) Failure of control equipment;

- 5) The Contractor shall produce all detailed design documents and drawings. Full details shall be submitted for approval by the Engineer;
- 6) The Contractor shall produce detailed documents describing the setting of the radio and system parameters. Full detail shall be submitted for approval by the Engineer; and
- 7) The Contractor shall produce all design submissions, as-built documents, and drawings under the requirements of the ERG.

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~~The handover success rate should be at least 99.5% over train routes under design load conditions.~~

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The Contractor shall develop and submit to the Engineer for Approval a detailed Test Plan of the tests and procedure proposed.

The Contractor shall ensure the system is in a state ready for testing and commissioning before the commencement of the tests to be witnessed by the Engineer. The Contractor may conduct trial tests by himself before the Engineer witnesses the tests.

The Contractor shall provide all necessary equipment and test instruments, special tools, emulators, simulators, and test software, to carry out the test at his disposal.

Unless otherwise stipulated herein, the Contractor shall carry out all the tests and commissioning activities following the Employer’s Requirements.

The Contractor must bear the cost of all necessary tests. As for the cost of the test which is carried out outside the Philippines, the Contractor must bear the expenses.

All the test plans and procedures with the exact time and date shall be submitted for the approval of the Engineer at least 30 days before any test conduction.

The testing and commissioning shall, as a minimum, include the following items:

1) Factory Acceptance Tests (FAT)

- The Contractor shall carry out the FAT at the premise of designated manufactures.
- The test shall include, but shall not be limited to visual, environmental, electrical, and functional tests on each item of equipment and the associated sub-systems as well as simulation, before delivering them to the site,
- The testing shall be conducted such as to simulate the working conditions as closely as possible.
- Destruction tests shall be carried on components and assemblies to verify the design loading.
- All the tests shall be conducted both on the assembly and on the members/components of each product following the test plan and the applicable standards give a Notice of No Objection by the Engineer.

2) Installation Tests

- The Contractor shall carry out the installation tests for the Telecommunication sub-systems individually in each site on completion of the physical equipment installation including electrical connections.
- Before the installation Tests, visual inspection and operational tests on un-energized equipment shall be carried out to check items including but not limited to:
 - a. Workmanship and Cleanliness,
 - b. Confirmation of items confirming to rating specified,
 - c. Water and dust proofing,
 - d. Leveling, Mounting, and Positioning,
 - e. Joints and Connections tightness,
 - f. Cable-dressing, bending radius, jointing and finish at terminals,
 - g. Clearances and dimensions in conformity with the Drawings,
 - h. Earthing and Bonding,
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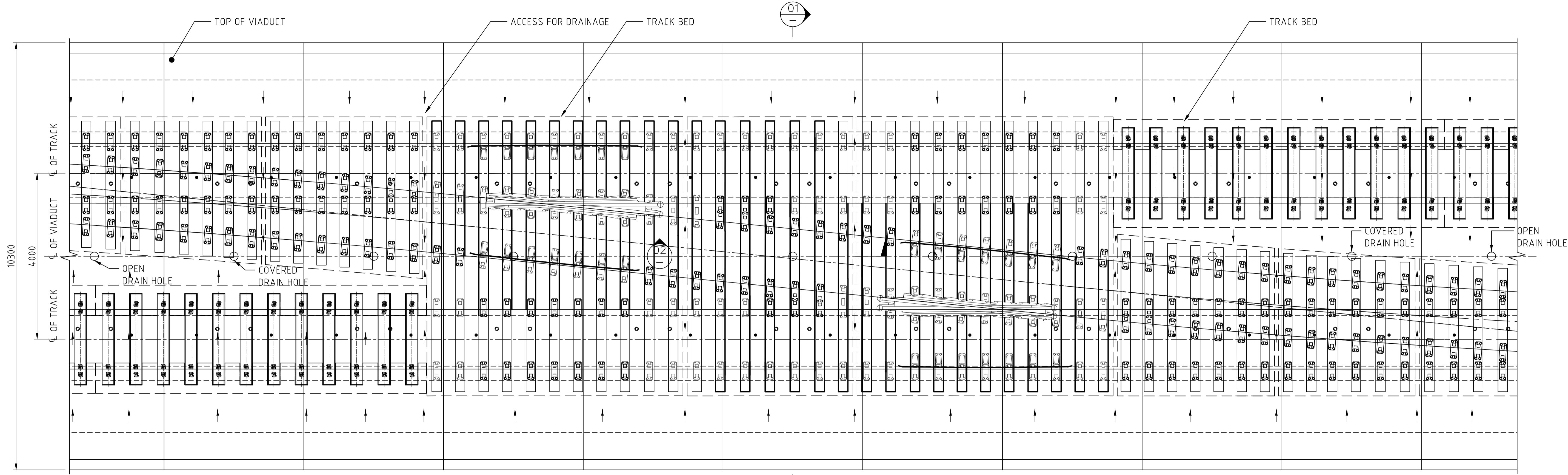
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 - h. Earthing and Bonding,
 - i. Functioning of circuit breakers,

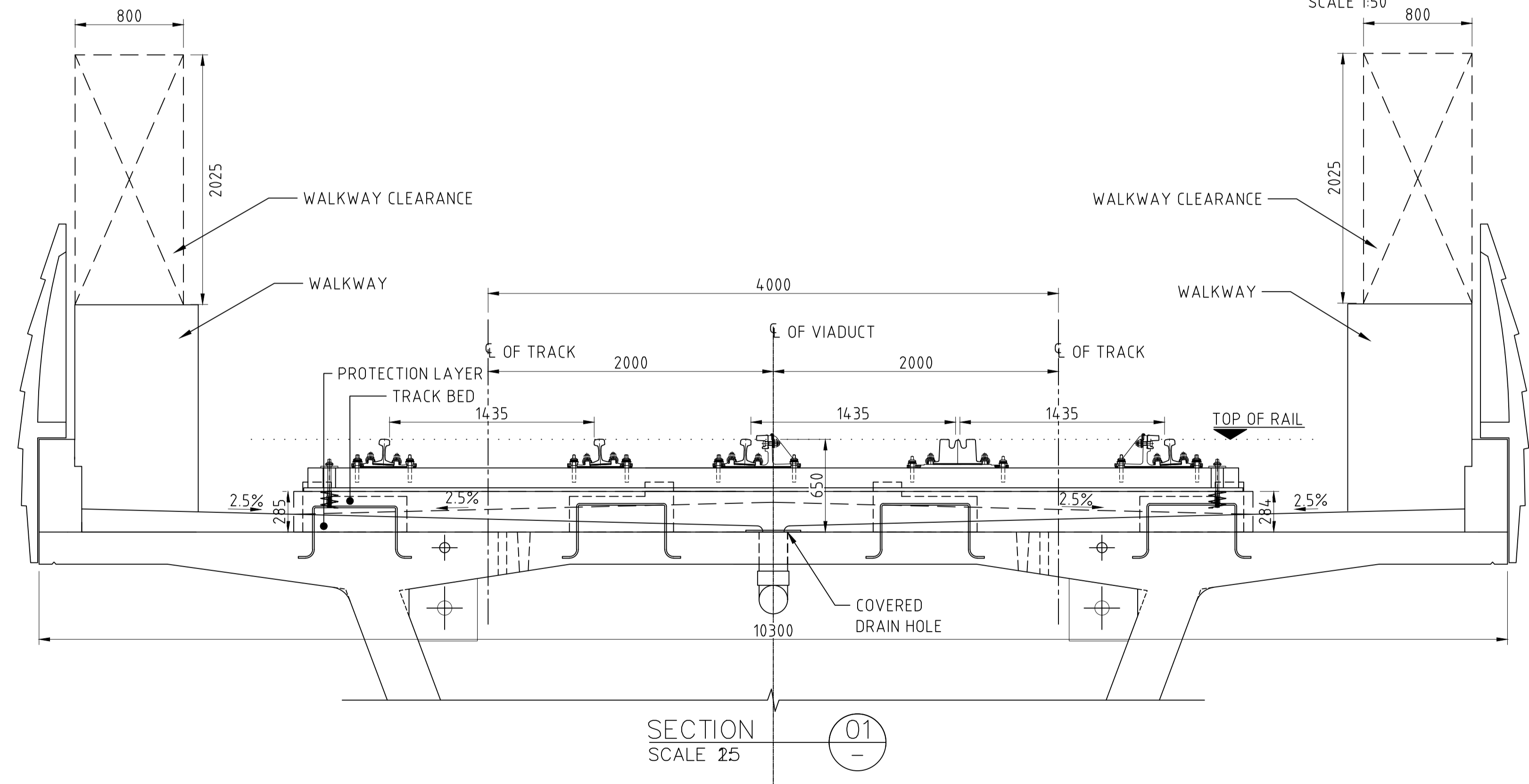


DRAINAGE SYSTEM FOR BALLASTLESS TRACK
SCALE 1:50

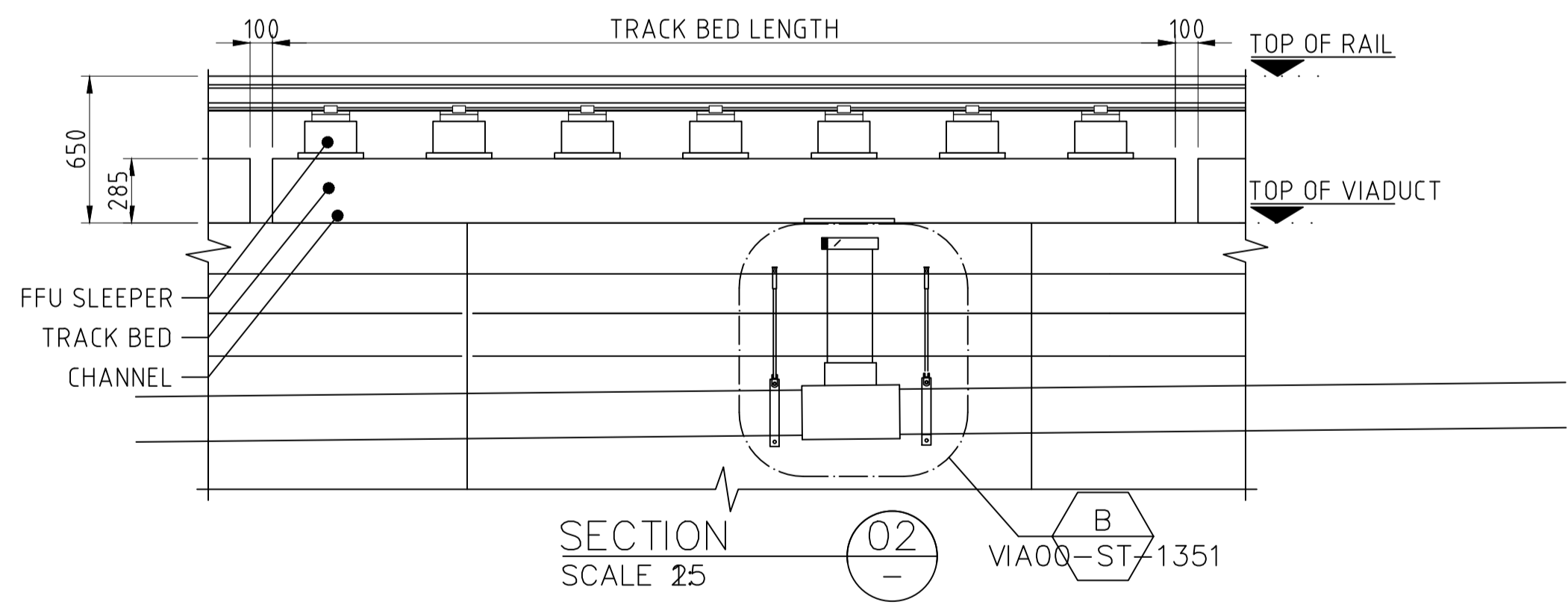
THE 100mm GAP BETWEEN THE TRACK BED SHALL BE REVERSE GRADED TO ALLOW WATER TO BE DRAIN IN TO SIDE DRAINS, THIS SHALL BE COORDINATED WITH CIVIL CONTRACTOR

THE TRACK BED SHALL BE SUITABLY WITH A MINIMUM 1.0% SLOPE TOWARDS THE NEAREST DRAIN TO ENSURE THAT THERE IS NO WATER POUNDING.

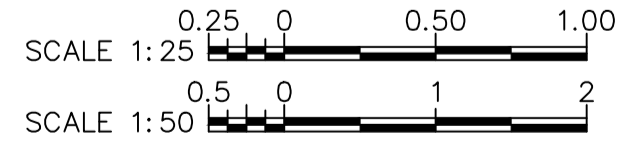
FOR AREAS OTHER THAN SCISSOR CROSSOVER AND CROSSOVER, THE DRAINAGE DETAILS HAS BEEN SHOWN IN THE RESPECTIVE TRACK ARRANGEMENT DRAWING.



SECTION 01
SCALE 25





SECTION 02
SCALE 25
VIA00-ST-1351



- NOTES:
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
 - FOR DETAILS OF DRAINAGE IN VIADUCT REFER TO DRAWING NO. MCRP-DWG-VIA00-ST-1351







Last modified by AGUILAR / 09 Dec 2020
Filename: C:\Users\NAGUILAR\Desktop\MY FILES\ORGANIZE CAD FILES\MCRP\TRACKWORKS\MCRP-DWG-GEN-TK-04-08 (updated)

VERSIONS	DATE	DESCRIPTION
03	15 MAY 2019	ISSUED FOR REFERENCE
04	17 NOV 2020	WALKWAY ADDED

 DEPARTMENT OF TRANSPORTATION (DOT)
 PHILIPPINE NATIONAL RAILWAYS

CONSULTANT

JICA DESIGN TEAM (JDT)

 ORIENTAL CONSULTANTS GLOBAL CO., LTD.	 JAPAN INTERNATIONAL CONSULTANTS FOR TRANSPORTATION CO., LTD.
 KATAHIRA & ENGINEERS INTERNATIONAL	 TONICHI ENGINEERING CONSULTANTS INC.
 PACIFIC CONSULTANTS CO., LTD.	 TOKYO METRO CO., LTD

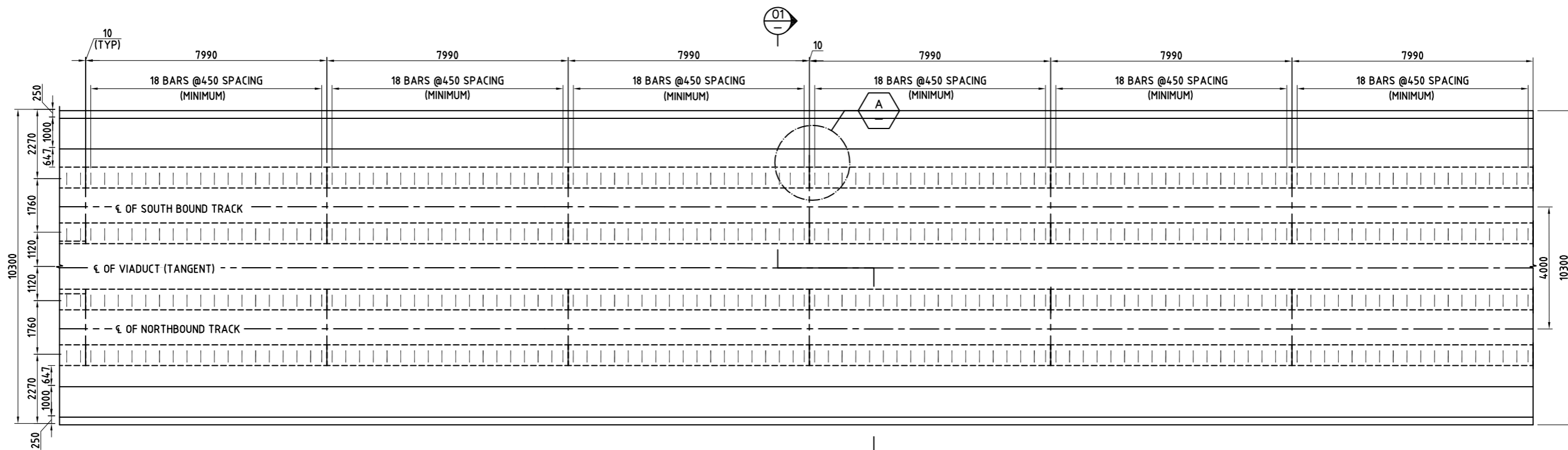
TITLE	JDT	SMEC
DESIGNER	S. HASHIMOTO	R. ACOSTA JR.
CHECK	S. YOSHIMOTO	V. BALAKRISHNAN
TEAM LEADER	K. KUSANAGI	W. FRENCKEN
P. MANAGER	Y. MAEDA	R. YUZON JR.

E & M SYSTEMS AND TRACK WORKS PACKAGE CP NS-01 : BIDDING DOCUMENTS

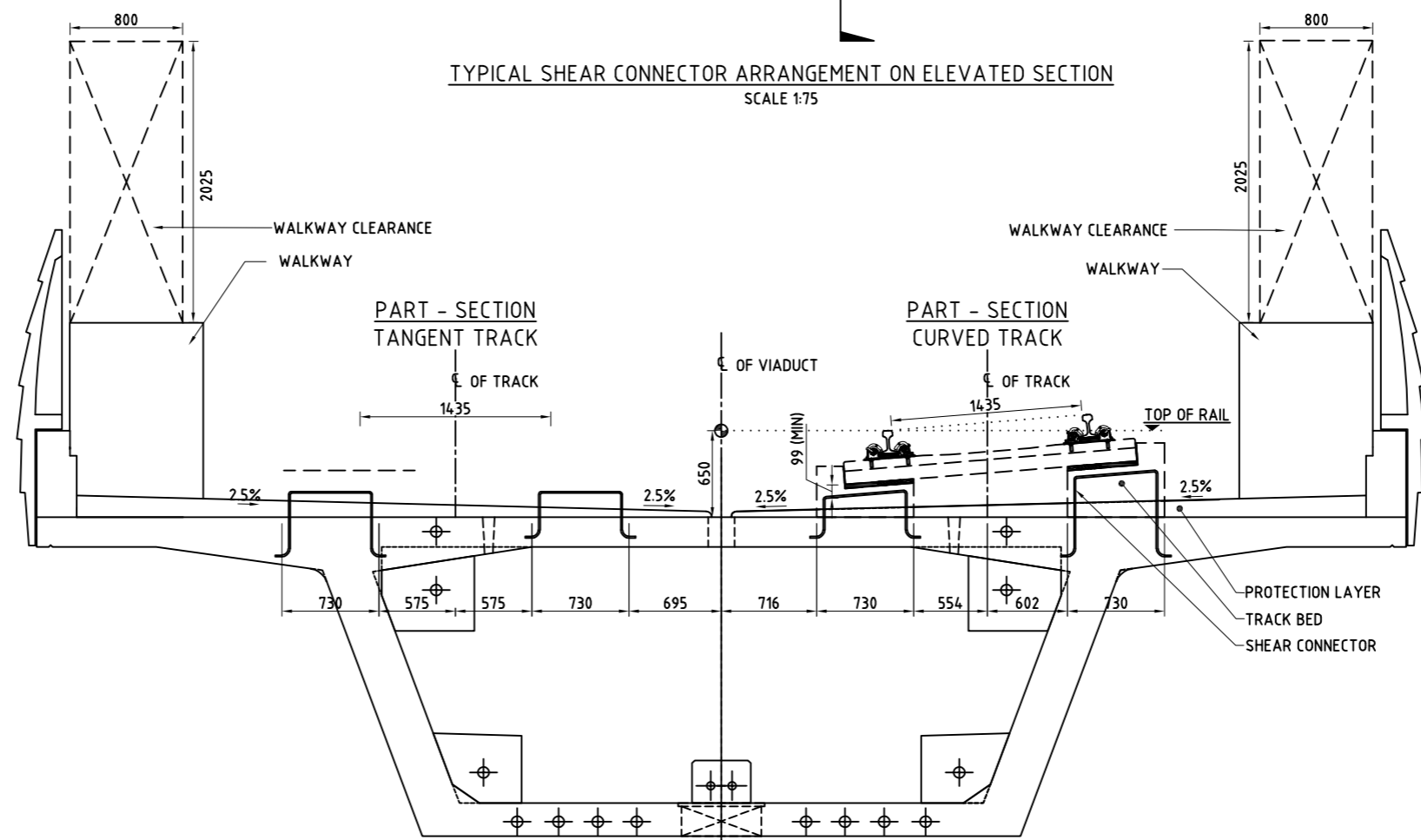
FOR REFERENCE

TYPICAL DRAINAGE SYSTEM FOR BALLASTLESS TRACK

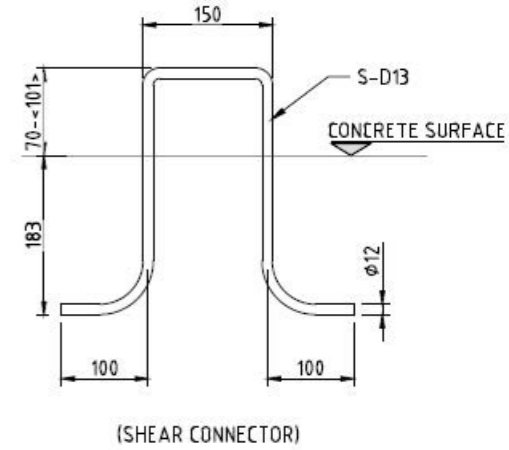
DATE	MAY 2019
SCALE	AS SHOWN IN A1
SHEET No.	
DRG No.	MCRP-DWG-GEN-TK-0408
DRG S.	REV 04



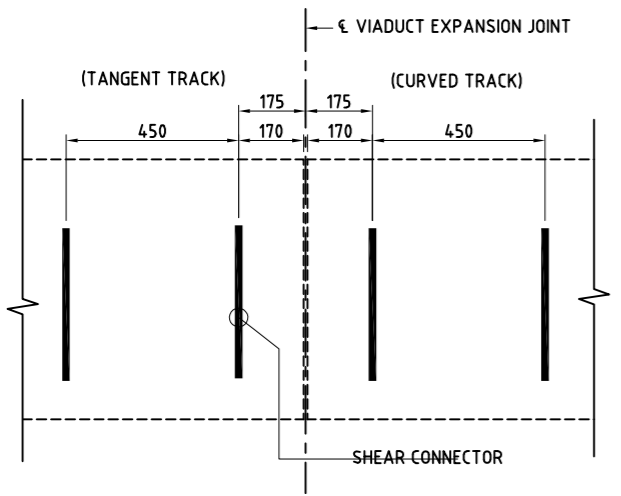
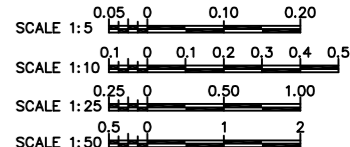
TYPICAL SHEAR CONNECTOR ARRANGEMENT ON ELEVATED SECTION
SCALE 1:75



THE ARRANGEMENTS HAS BEEN SHOWN IN PART-PLAN TO ACCOMMODATE DETAILS OF BOTH (TANGENT & CURVED) TRACK IN ONE DRAWING.
PROTECTION LAYER IS LAID AFTER TRACK SLAB CONSTRUCTION.
* VALUES SHOWN ARE INDICATIVE. THESE DIMENSIONS SHOULD BE WORKED OUT BASED ON ACTUAL CANT APPLIED. MAXIMUM CANT APPLIED IS 180mm.



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. FOR DETAILS OF TRACK ARRANGEMENT REFER TO DRAWING NO. MCRP-DWG-GEN-TK-0140 (FOR TANGENT TRACK). MCRP-DWG-GEN-TK-0141 (FOR CURVED TRACK).



DETAIL SCALE 1:10

SECTION 01-01 SCALE 1:25

Last modified by AGUILAR / 07 Dec 2020
Filename: C:\Users\Aguilar\Desktop\ORGANIZE CAD FILES\MCRP\TRACKWORKS\MCRP-DWG-GEN-TK-0142 (REVISED)

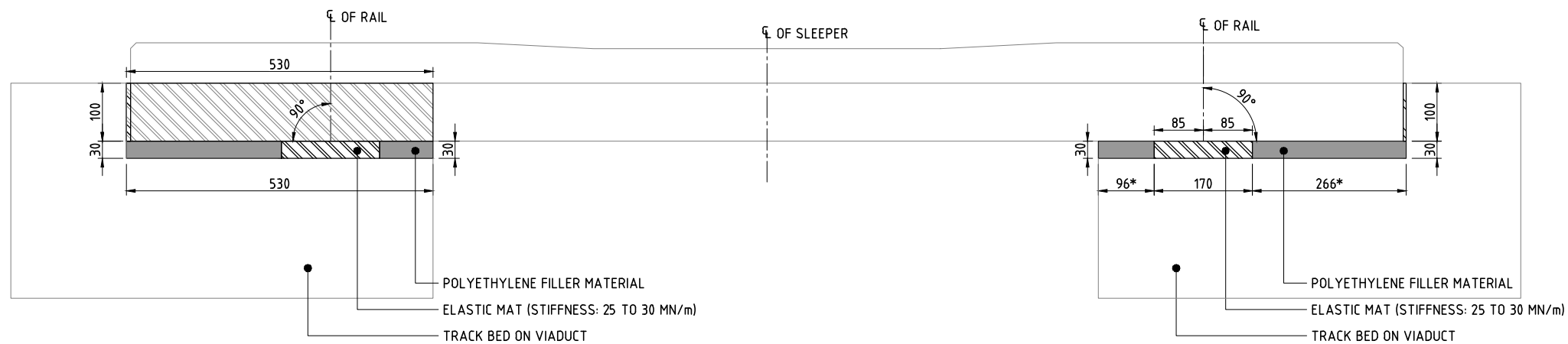
VERSIONS	DATE	DESCRIPTION
03	15 MAY 2019	ISSUED FOR REFERENCE
04	17 NOV 2020	WALKWAY ADDED
05	20 APR 2021	ISSUED FOR ADDENDUM

CONSULTANT
JICA DESIGN TEAM (JDT)

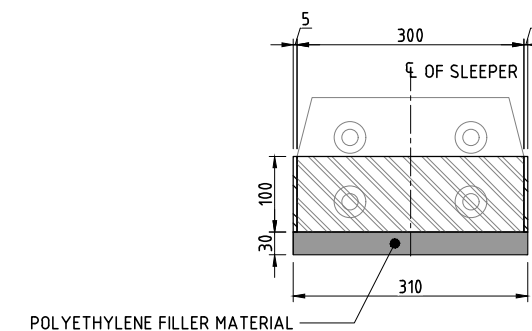
TITLE	JDT	SMEC
DESIGNER	S. HASHIMOTO	R. ACOSTA JR.
CHECK	S. YOSHIMOTO	V. BALAKRISHNAN
TEAM LEADER	K. KUSANAGI	W. FRENCKEN
P. MANAGER	Y. MAEDA	R. YUZON JR.

E & M SYSTEMS AND TRACK WORKS
PACKAGE CP NS-01 : BIDDING DOCUMENTS
FOR REFERENCE
TYPICAL SHEAR CONNECTOR ARRANGEMENT
ON ELEVATED SECTION

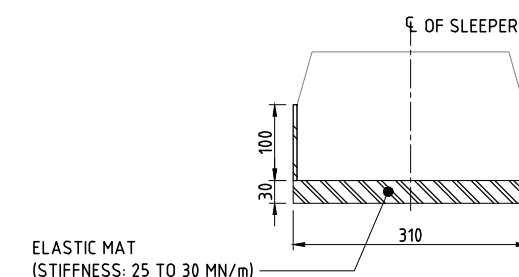
DATE	SCALE	SHEET No.	DRG No.	DRG S.	REV
MAY 2019	AS SHOWN IN A1		MCRP-DWG-GEN-TK-0142		05



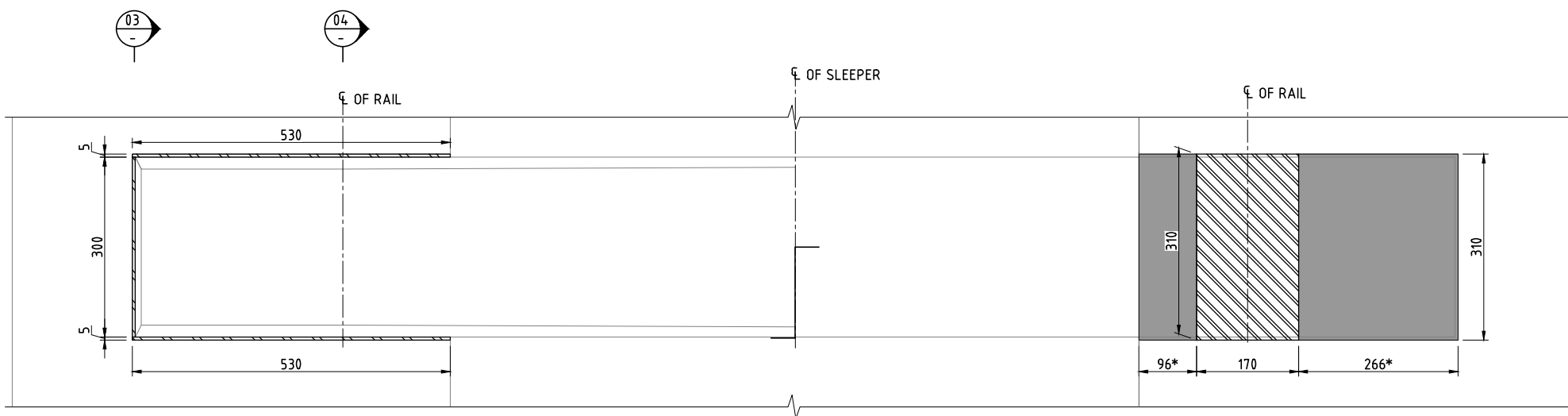
SECTION 01
SCALE 1:5



SECTION 03
SCALE 1:5



SECTION 04
SCALE 1:5



PART - TOP PLAN

PART - BOTTOM PLAN

PLAN - SEF SYSTEM ON FOR MAIN LINE TRACK
SCALE 1:5

* VALUES SHOWN ARE INDICATIVE. THESE DIMENSIONS SHOULD BE WORKED OUT BASED ON ACTUAL CANT APPLIED.

THE ARRANGEMENTS HAS BEEN SHOWN IN PART-PLAN TO ACCOMMODATE DETAILS OF BOTH (TOP & BOTTOM) IN ONE DRAWING.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. FOR DETAILS OF PSC SLEEPER REFER TO DRAWING NO. MCRP-DWG-GEN-TK-0205
3. FOR DETAILS OF TRACK CROSS SECTION REFER TO DRAWING NO. MCRP-DWG-GEN-TK-0122 (FOR ELEVATED SECTION). MCRP-DWG-GEN-TK-0103 (FOR EMBANKMENT SECTION).



Last modified by SS6200307 / 15 May 2019
Filename: V:_Vault\Projects\7051194\MCRP\CAD\DWG\05_TK_Track_Design\MCRP-DWG-GEN-TK-0200

VERSIONS	DATE	DESCRIPTION
03	15 MAY 2019	ISSUED FOR REFERENCE
04	14 APR 2021	ISSUED FOR ADDENDUM

CONSULTANT
JICA DESIGN TEAM (JDT)

TITLE	JDT	SMEC
DESIGNER	S. HASHIMOTO	R. ACOSTA JR.
CHECK	S. YOSHIMOTO	V. BALAKRISHNAN
TEAM LEADER	K. KUSANAGI	W. FRENCKEN
P. MANAGER	Y. MAEDA	R. YUZON JR.

E & M SYSTEMS AND TRACK WORKS
PACKAGE CP NS-01 : BIDDING DOCUMENTS
FOR REFERENCE
TYPICAL DETAILS OF SEF SYSTEM ON TRACK BED

DATE	MAY 2019
SCALE	AS SHOWN IN A1
SHEET No.	
DRG No.	MCRP-DWG-GEN-TK-0200
DRG S.	REV 04