



General Bid Bulletin No. 6

10 June 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 Awards Committee

SIGNATURE REDACTED

ENGR. JAIME M. NAVARRETE, JR
Chairperson

Annex A

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
1	Volume I of IV - PART 1 Bidding Procedures, BF-21, APPENDIX 7.3: PROPOSED METHOD OF IMPLEMENTATION OF THE WORKS, 4.8 Provision of the following data and/or documents on Depot Facility	Kindly provide some details on what is expected as deliverable in the following items: 4.8.10 details of the provisions made for interfaces with other Interface Contractors and 4.8.11 preliminary provisions made for interfaces with Railway System Packages.		Bidder should refer to Clause 20 of ERG in Part 2 – Employer’s Requirements, Section V1.-Employer’s Requirements- General Requirements and Clause 8.11 of ERT in Part 2 – Employer’s Requirements, Section V1.-Employer’s Requirements, Technical Requirements -Depot Facilities for details regarding interfaces required with other Interfacing Contractors and system sub-contractors at various stages of the Project. PROPOSED METHOD OF IMPLEMENTATION OF THE WORKS shall contain details of provisions of required resources and strategy in order to demonstrate bidder's understanding and ability to achieve Project deliverables like "Completion of the Milestones, Key Dates and also the whole of the works by the Time for Completion" as specified in the Bid document.
2	Volume II of IV - PART 2 Employer’s Requirements, ERT - 949, N61.04 Rescue device, 3.4. Temporary rescue truck	It is indicated that the truck should be used for carrying a damaged wheelset. Please confirm whether the item N41.02		The Bidder shall refer to functional requirement given for N61.04. in ERT 949 for details. Shunting locomotive N41-02

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
		Shunting Locomotive (Engine Type) can be used for this purpose.		with flat car or a road vehicle can be used for transportation.
3	Volume II of IV - PART 2 Employer's Requirements, ERT - 949, N61.04 Rescue device, 2.3. The containers shall be designated 'Rerailing' and 'Rescue' and shall be kept at the depot in a location that will readily permit the containers to be loaded with a crane onto vehicles, i.e., flat cars or truck	It is indicated that the containers shall be loaded with a crane onto vehicles. Please confirm whether the item N41.02 Shunting Locomotive (Engine Type) can be used for this purpose (receiving the containers).		The Bidder shall refer to functional requirement given for N61.04. in ERT 949 for details. Shunting locomotive N41-02 with flat car or a road vehicle can be used for transportation of containers.
4	Volume II of IV - PART 2 Employer's Requirements, ERT - 738, N02.17 Sewage Discharge Pipe, It is indicated that: 2.1. The sewage discharge pipe shall be provided for discharge from the sewage tank on each car and transfer to sewage drainage hole in the N01 Light Repair Shop.	Please confirm that the sewage drainage hole is under the Building Contractor responsibility.		The Bidder's understanding is correct. Necessary interface shall be done with the Civil contractor of CP-N-05.
5	Vol 2, ERT 425, 4.4.1 4), e. Rated current: 1,250A	Referred clause is in contradiction with the SLD, where outgoing feeder ratings have been mentioned as 630A and incoming feeder rating		The reference drawing is conceptual design and for information only. This is a design

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
		mentioned as 1000A. Since the current at HV side will not be so high considering the loads, please allow the contractor to propose suitable values for the ratings.		and build project. The contractor should submit design for approval of the Engineer.
6	Vol 2, ERT 175, 2.33.2, Equipment that has been tested and approved for unconditional and unrestricted use on any passenger-carrying railway by any Railway administration may be exempted from fresh type approval test by the Engineer. However, for this exemption a viable certificate issued by the concerned Railway administration must be submitted to the Engineer for verification and acceptance. The Engineer's decision will be final.	Type test waiver for already tested and approved systems is described only in the Signalling chapter. Please make this requirement applicable for all the subsystems.		ERG amended. Please refer to Annex B of this GBB.
7	Vol 2, ERT-402 ERT 175, 4.7.2, "FAT shall comprise Type Tests, Sample Tests, Routine	FAT shall comprise routine tests/acceptance tests as per the relevant standards and FAT procedures submitted by the suppliers/manufacturers.		No change will be made to the clause.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	Tests, Life, Endurance and Destruction Tests, and any additional tests requested by the Engineer. The testing shall be conducted such as to simulate the working conditions as closely as possible. Upon the request of the Engineer, 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 in accordance with design specifications and applicable Standards."	Please remove Type Tests, Sample Tests, Routine Tests, Life, Endurance and Destruction Tests, and any additional tests from FAT.		
8	Vol 2, ERT-360, 4.1.1, Power feeding diagram	Please provide the location and chainage of Depot SP in "Table 4.1-1 Location of TSS, SP, BP at Mainline and Depot Area".		The Bidder should review all tender drawings covering the depot area including drawing no. MCRP-DWG-DSP-AR-3011 in Employer's Requirements Drawings.
9	Vol 2, ERT-376, 4.4.1, 1) 69kV switchgears, transformers, rectifier equipment and 6.6kV substation cubicles shall be outdoor type.	Bidder proposes Indoor/Outdoor type Rectifiers without compromising performances. Please confirm that Indoor type Rectifiers can be proposed.		The specified Substation Equipments should be of outdoor type as stated in the technical requirements.

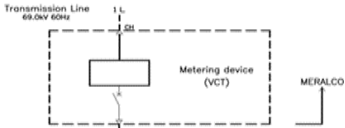
PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
10	Vol 2, ERT-364, 4.1.3/System Studies, ii. BP (Battery Post) traction power simulation studies; iii. Re-generating power absorbing device study, specification and effect;	As during the tender stage, Rolling Stock information are not available to perform the traction simulation to ascertain the rating of the regenerative resistor unit and the battery post, please provide the rating of the regenerative unit and the battery post at each location to be considered in the offer.		Ratings and specifications of the battery post is defined in clause 4.4.5 of the technical requirements (ERT 382). Determination of other parameters is an interface works with concerned discipline.
11	Volume I of IV PART 1 – BIDDING PROCEDURES, BDS - 4 BF - 21, ITB 16.1 (b) 3.5, "The spare parts, special tools, etc. shall be supplied and sufficient for the full operation of the Works for a period of Four (4) years after the Employer's Taking Over of the Works, and as specified in the Employer's Requirements." "plan to make sure that spare parts and consumable parts will be	Please confirm for which duration the spare parts must be provided.		Reference to the Employer's Requirements - General Requirements clause 13.4.3, the spares shall be replenished by the Contractor at the end of Defects Notification Period (DNP). Reference to the Part 3 Particular Conditions - Contract Data, sub-clause 1.1.3.7, the DNP is two (2) years per Section/Sub-section. The bidder shall refer to Employer's Requirements for the details of the spare parts, special tools, etc. requirement. Please refer to the Annex B for the amendment.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	available for the maintenance work for at least five (5) years following completion of the whole of the Works;"			
12	<p>Vol 2, ERT 363 & ERT 413, 4.1.2 1), iv. electric companies shall provide independent voltage transformers (VT) and current transformers (CT) in an exclusive use package in each substation for metering electrical energy on each incoming feeder.</p> 	<p>The RFP calls only for VT and CT to be supplied by the utility. However, the SLD shows metring device (VCT) and additional Circuit Breaker.</p> <p>Please confirm that this additional Circuit Breaker will be supplied by the utility as well.</p>		<p>This will be subject to utility provider's latest practice and the contractor shall coordinate with the utility provider during implementation.</p>
13	<p>Volume 1 of IV – Part 1 – Bidding procedures / Section 2 Bid Data sheet, 32/394, ITB 20.3 (b), The local currency portion (Philippine Peso) of the fixed portion of the Contract Price shall be adjusted by applying the Consumer Price Index of the Philippines (all items) published by</p>	<p>It is not clear for the Contractor that the fixed portion will be adjusted or not.</p> <p>Bidder's understanding is that the fixed portion of 15% will remain with no adjustment and the adjustment will be applied only on the remaining 85%.</p>		<p>The Bidder's understanding is incorrect. Reference to the Instructions To Bidder (ITB) article 20.3 and 20.3(b), fixed portion of the Bid Price shall be adjusted if the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial Bid validity.</p>

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	the Philippine Statistics Authority (PSA). The foreign currency portion (Japanese Yen) of the fixed portion of the Contract Price shall be adjusted by applying the Consumer Price Index of all items published by the Statics Bureau of Japan. The foreign currency portion (United States Dollars and/or Euro) of the fixed portion of the Contract Price shall be adjusted by applying the institutional organization in the originating country.	Can the Employer confirm the same understanding?		
14	Volume IV of IV – Part 3 – Section VIII - Particular Conditions – Part B specific conditions, 46/72, 14.2, Use of the Advance Payment for purposes other than mobilization is prohibited. The Contractor shall provide proof of expenditure of the Advance Payment in compliance with Annex 6 – Advance Payment Security.	Please advise what are the acceptable proofs of expenditure.		Bidder may refer to the General Conditions (GC) 14.3 [Application for Interim Payment Certificates], 14.4 [Schedule of Payments] and Price Schedule for the details.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
15	Volume IV of IV – Part 3 - Section VIII – Particular Conditions – Part B specific conditions , 43/72, , Electricity for testing, commissioning, trial running and performance proving of Rolling Stock and associated E&M Systems will be provided by several 3rd Party Interfaces. A Provisional Sum is included in the Pricing Schedule for that purpose.	<p>Can the Employer confirm that all costs of electricity will be cover by him even in the case that more provision is needed?</p> <p>Your confirmation will help to avoid any provision by the Contractor to be included in the costs.</p>		Please refer to the Schedule 1.6 Provisional Sums item no. PS-04 for the details.
16	Part 1 – Section IV – Bidding forms – Schedule 1 Price Schedule & Preambles , , , The Contract is to be carried out on a lump-sum price basis, where payment to the Contractor will be made according to achieved milestones unless otherwise specified in the Contract. The Contract Price is not subject to re-measurement and neither is it to be adjusted by reason of the actual quantities of work executed being more or less than the estimated	<p>Bidder understands that this contract is a lump-sum price. Meanwhile in the price schedule there is a column “Quantity” with 1.</p> <p>Please confirm that the Bidder should not modify this column and consequently the column unit price will be always equal to the column Amount.</p>		The Bidder shall not modify the number in the column "Quantity". The Amount = Quantity x Unit Rate.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	quantities used by the Bidder in the calculation of the Bid price.			
17	Part 1 – Section – Price Schedule , 112/394, Item 112 of the price schedule 1.1.1 General items, Providing necessary services during the Defects Notification Period (including materials and goods, management and operatives input, plus any necessary temporary facilities of any kind).	Please confirm if this line of the price schedule concerns the services performed by all sub-systems?		The Milestone is referring to the necessary services during the Defects Notification Period provided by the Contractor. Please refer to the Employer's Requirements for details.
18	Part 1 – Price Schedule , , Price Schedule, Payment milestone for System acceptance tests, integrated testing and commissioning	Please confirm if Bidder has to include the cost of: 1) Independent safety assessor 2) Safety certificate from the relevant authority for the commercial operation of the railway		Bidder may refer to the Employer's Requirement - General Requirements item 21 [System Assurance] and Appendix 6 [Engineering Safety Management Plan] for the detail scope of works.
19	Part 1 – Price Schedule – Schedule 1.8 Capital spares , 314/394, ,	For all the equipment with no quantity mentioned, please confirm this is the contractor responsibility to propose adequate quantity. Or should the Bidder quote a quantity of 1 as a reference of unit price ?		The column "unit" shown in the Schedule 1.8 is referring to the standard units used for measurement. Please refer to the Schedule 1 - Price Schedules - Preambles item 3 for the guideline on the preparation Price Schedule 1.8 Capital Spares.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
20	Part I Section IV. Bidding Forms, BF - 255, Schedule 2: Table of Adjustment Data - Table A. Local Currency (LC) Source of Index, *1: The Department of Labour and Employment (DOLE)	The Source of Index cannot be found on below website: https://www.dole.gov.ph/ Kindly share the exact link or data for the referred DOLE Source of Index.		The Bidder may refer to the <u>National Wages and Productivity Commission (NWPC) which is an attached agency of the Department of Labor and Employment (DOLE).</u> https://nwpc.dole.gov.ph/
21	Part I Section II. Bid Data Sheet, BDS - 8, ITB 20.3 (b), The foreign currency portion (United States Dollars and/or Euro) of the fixed portion of the Contract Price shall be adjusted by applying the institutional organization in the originating country.	The bidder is likely to have expenses in several originating countries with different inflation rates in order to reflect more accurately the originating cost structure. For example, the bidder could have Material expenses in: Germany (1.3% average inflation), China (2.9% average inflation), and India (7.6% average inflation). Example of composition of Material Index : (a x index Germany + b x index China+ c x index India) with a+b+c=1 Kindly confirm our understanding for multiple countries indexes (in this example Germany,		The Bidder's understanding is incorrect. It is referring to the index published by the institutional organization in the originating country of the particular foreign currency.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
		China and India indexes) can be linked with 1 foreign currency (e.g. Euro).		
22	Part 1 – Form SPA - Contractor list of proposed Spare parts, , ,	Please confirm if the list of spare parts to be proposed in the form SPA are the spare parts already included in the contractor's bid amount? Or this is an additional list?		The spare parts shall be the Contractor's scope. Please refer to the Section IV Bidding Forms Appendix 7.8 and Employer's Requirements for detail.
23	Part 1 – Form SPA- 2 – Capital Spares , , ,	Please confirm if this list is the same as the Price Schedule 1.8 but without prices?		The Bidder's understanding is correct.
24	Part 3 – Volume 4 , , , Provisional Sums 13.5.(b)(ii) Fifteen percent (15%) of the actual amounts paid (or due to be paid) by the Contractor.	This sentence is not clear, please clarify. Our understanding is the provisional sums are foreseen by the employer for the concerned subjects.		Please refer to the Section VII General Conditions (GC) page GC-54 item 13.5 for the detail description for Provisional Sums.
25	Volume II of IV - PART 2 Employer's Requirements, ERT - 710, Table 8.13 Special Equipment and Tools of the railway system and the rolling stock,	The Employer is kindly requested to give more technical details on the requested equipment and tools.		Table 8.13 updated. Technical details and functional requirement added in new Section N71.03 and S71.03 in Appendix 8.1 A and B of the ERT respectively. Please refer to Annex B.
26	Volume II of IV - PART 2 Employer's Requirements, ERT - 710, Table 8.13 Special Equipment and Tools of the railway system and the rolling stock,	Please indicate the share of works between CP NS-01 Contractor and Rolling Stock Contractor in the supplying of those Special Equipment and Tools.		Table 8.13 updated. Tentative share of works between NS-01 and Rolling stock Contractor is indicated in the revised table 8.13. Please refer to Annex B.
27	Vol 2, ERT-368, 4.1.3 (10), ii. Rectifier equipment 69kV/1180V gas insulated self-	Bidder proposes dry type Rectifier transformers which can be indoor, most compact and proven, instead of oil/gas cooled Rectifier transformer.		The rectifier transformer should be of outdoor type as specified in the technical

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	cooling or oil insulated transformer self-cooling Rectifier transformer (eco-friendly type);	Please confirm that dry type Rectifier transformers can be proposed.		requirements. Please see clause 4.1.1 (1) ERT 361 and clause 4.1.1 (1) ERT 411.
28	Vol 2, ERT-417, 4.1.3 (9), 2) Rectifier equipment 115kV/1180V and 34.5kV/1180V Gas insulated or oil insulated self-cooling type Rectify transformer;	Bidder proposes dry type Rectifier transformers which can be indoor, most compact and proven, instead of oil/gas cooled Rectifier transformer. Please confirm that dry type Rectifier transformers can be proposed.		The rectifier transformer should be of outdoor type as specified in the technical requirements. Please see clause 4.1.1 (1) ERT 361 and clause 4.1.1 (1) ERT 411.
29	, ERT-151, 2.19.3, Level Crossing in the Depot (Mabalacat and Banlic) The Contractor shall supply, install and integrate a level crossing system at the Depots comprising of sliding gate barrier, visual and audible warning devices (e.g., flashing lights and a siren). The crossing would form protection for the road traffic crossing over the (i) test tracks (for which the contractor shall provide sliding gate barrier) inclusive of (ii) any other access roads where this may	Please confirm the type of operation that is needed for the LX Gate: Automatic or Manual? Please confirm if the LX gate includes portacabin for controlling feature or if a Gateman building will be provided.		The contractor shall propose operation of Level crossing in the Depot in consultation with O&M Contractor. The Contractor shall arrange for all requirements including Gateman cabin in case manual Gate operation is decided.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	occur (to be provided with audio visual warning devices).			
30	, ERT-1014, 9.2.3, F) Level crossing road i. Level crossing alarm (With speaker warning light, train direction indicator, Emergency button) ii. Barrier machine iii. Crossing obstructing detector iv. Obstruction warning device for level crossing	Please elaborate the function/details of crossing obstructing detector and obstruction warning device. Please confirm the dimensions of LX i.e. height, length, other dimension for barrier.		The contractor shall propose arrangement of Level crossing gate similar to what is provided at Depot, at design stage in co-ordination with other contractors.
31	, ERT-151, 2.20.2, Points and Crossings: - Point machines shall be capable of operating points with curved/thick web section with EN 60 (60 kg/m) stock rail and JIS 50 within the Depot. Turnouts used shall comprise of 1:6, 1:8, 1:10 and 1:12 radii. Nominal switch opening at toe will be 160mm.	Please confirm if the point machine can be of electrohydraulic type.		Main line point machines shall be non-trailable. Main Line Machines shall be electric, and where possible operate on commercially available voltages. Refer paragraph 2 of clause 2.20.2.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
32	, ERT-1071, 12.2.4, All migration works shall be coordinated and agreed with the O&M Concessionaire. Redundant equipment from the decommissioned OCC's shall be returned to the Employer. The migration plan shall be submitted to the Engineer for approval	Please confirm what are the equipment's that need to be de-commissioned.		The equipment to be decommissioned shall depend upon the design and migration strategy of the contractor.
33	, ERT-124, 2,17, The ATS system shall ensure central control from Operation Control Centre, local control from each main line Station Control Room, and the Depot control from the OCC. The ATS networking shall guarantee fault tolerance, transfer of controls between control levels, hotstandby redundancy ensuring transparent switchover, ATS scalability and without loss of data.	"Depot control from the OCC" – Bidder assumes that the single set of hot-redundant ATS server located at OCC will control both mainline and depot. Please confirm our understanding.		The Bidder's understanding is incorrect. The Depot shall be controlled by separate ATS servers independent of OCC servers. Please refer to Annex B.
34	, ERT-124, 2,17, The ATS sub-system component of Category 3 shall	Please confirm the quantity of off-line workstations required.		The minimum number of off-line workstations shall be at least two. It is

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	comprise of: 1) Off-line workstations; 2) Playback system; and 3) Training Simulator.			expected that these workstations can perform both functions of Playback and Training.
35	, ERT-124, 2,17, ATS functions shall be available in the OCC and SCR(s). The ATS facility for the Depot shall be available in the OCC.	Bidder assumes that Station Control Room (SCR) will be there only at the inter-locking stations. Please confirm our understanding. Please detail the ATS functionalities expected at SCR of interlocking stations and SCR of non-interlocking stations.		The Bidder's understanding is incorrect. The Station Control room (SCR) shall be at all stations. ATS functionality shall be available at all SCRs. Interlocking stations shall have route setting facilities and non interlocking stations shall have monitoring and emergency facilities including PSD.
36	, ERT-124, 2,17,	Please confirm the quantity of parallel dispatchers required at OCC in Mabalacat and Banlic depot.		The contractor shall interface with O&M concessionaire to work out quantities required.
37	, ERT-124, 2,17,	Please confirm the quantity of parallel dispatchers required at IOCC		The contractor shall interface with O&M concessionaire to work out quantities required.
38	Volume II of IV, ERT-124, 2.17.8, 2.17.8 Workstations	Please confirm the quantity of workstations required at OCC, at Depot Control room, at interlocking stations and at non-interlocking stations.		The contractor shall interface with O&M concessionaire to work out quantities of workstation required.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
39	Volume II of IV, ERT-39, 1.17.10, Turnout Type: - #12SN	Please elaborate the meaning of #12SN turnout type as #12 also is available. Please elaborate the difference between #12SN & #12.		#12SN is Swing Nose type of turnout crossing. The crossing block represents the movable element of the swing nose crossing and can be in contact either with the right and left wing rail equipped with a point machine. The #12SN is used at the mainline sections with a running speed of 160km/h. #12 is the normal type of turnout with fix crossing and not movable.
40	Volume II of II, ERT (1070-1075), 12,2,	Please provide details (Type of Scada, Protocol, functionality etc..) of Scada system of N1 contract.		This is interface with other contractors.
41	Volume II of II, ERT (1070-1075), 12,2,	Please provide details on BMS Subsystem, such as: <ul style="list-style-type: none"> • Location of BMS • Protocol of BMS • Data Points of BMS 		This is interface with other contractors.
42	Volume II of IV, ERT-100 and 117, 2.10.1 and 2.15.1, 2.10.1 ETCS On-board Configuration: The Contractor shall provide on-board units (OBU) and all accessories at each end of the train. The EVC of	Section 2.10.1 & 2.15.1 are contradictory with each other. Please confirm whether bidder needs to consider one or two EVC per train.		Please refer item 6 and item 7 of Annex A of GBB5.

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

General Bid Bulletin No. 6

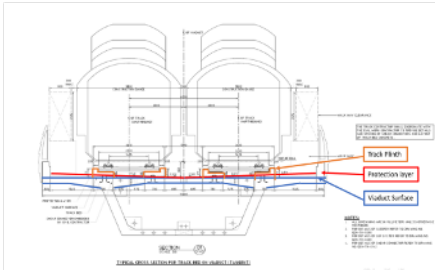
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	<p>the OBU shall be redundant. The Contractor shall propose the configuration of the redundant EVC. The ETCS equipment required within both train cabs shall be connected to the OBU by Ethernet, train lines or similar systems.</p> <p>2.15.1 The ATP on-board equipment shall manage and control both two cabs (the front cab and the rear cab).</p>			
43	Volume II of IV, ERT-152, 2.20.4, The Contractor shall supply balises, which comply with ETCS systems. The passive type but switchable balises may be required in sidings/depots with signals. They shall be located within the center of the track suitably affixed and aligned to ensure that data is easily transferred when read by the on-board ATC equipment. They shall be installed at areas to serve as overrun	As per RFP, Depot operation is in Manual shunting mode, there is no need for switchable balise in Depot and at siding track/storage track. Please confirm our understanding.		The Bidder's understanding is incorrect. Please refer to : (i) item 13 in Annex A of GBB3 (ii) Item 17 of Annex B of GBB3

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	protection, train position correction and other locations as may be required in accordance with ERTMS / ETCS subset 026 (SRS)			
44	Vol. II Part 2, Section VI (c) Technical Requirements (ERT), ERT - 18, 1.10.1 – Concrete Track Bed, 2) The Contractor shall prepare the finished viaduct deck for the installation of the trackwork. The Contractor will be responsible for construction of the first stage concrete to a level 650 mm (minimum) below proposed top of rail level to an unformed concrete finish.	For the avoidance of doubt, can you please clarify your terminology of 1st stage concrete, in relation to the drawing below. Our understanding is that the 1st stage concrete is the viaduct slab and second stage concrete is the track plinth. In this case the 1st stage concrete is provided by the civils not trackwork. Please confirm or clarify. 		1st stage is the track plinth and the second stage are other sections of track plinth to be concreted. 2.5% protection layer concrete are Civil scope. The stages of track concreting stated on ERT 1.10.1 are all under Trackwork contractor scope. The contractor shall submit a detailed methodology/procedure for track construction subject to Engineers approval.
45	Volume IV of IV - PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS, PC-12, Section 2:	The Employer is kindly requested to indicate the first train delivery date in North depot.		The estimated train delivery date is October 2023

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	the Malolos-Clark Railway Project (MCRP). Approximate length of 50.5 km and 6 stations),			
46	Volume IV of IV - PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS, PC-12, Section 2: the Malolos-Clark Railway Project (MCRP). Approximate length of 50.5 km and 6 stations),	Some essential depot equipment are necessary to receive the first train and do Test and Commissioning preparation. Bidder understands as essential depot equipment the following: Car Body Lifting Jack, Automatic car body washer and Shunting Locomotive (Both Rail and Road Drive Type). Please confirm if our understanding is correct.		The Bidder's understanding is incorrect. Bidder has to ensure all those facilities, which are needed to receive and commission the first train in the depot, are completed in time as per the Key dates specified at PC 12 for the Section 2 in Volume IV of IV - PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS- Particular Conditions.
47	Volume II of IV - PART 2 Employer's Requirements, ERT-710, Table 8.13 Special Equipment and Tools of the railway system and the rolling stock, Real time wheel geometry measurement system.	Please provide more technical details (functions, performance) on the Real time wheel geometry measurement system.		Please refer Annex B.
48	Volume II of IV - PART 2 Employer's Requirements, ERT- 691, Table 8.7 Major specification of Commuter Train (CP NS-02),	The Employer is kindly requested to give information about the train axle, wheels and coil spring characteristics (type, dimensions, drawings...)		The Bidder's request is rejected. This is an interface requirement with RS contractor. Interface shall be done during design stage with the RS contractor. For more details bidder may refer to bidding documents for

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
				Commuter Train (CP NS-02) available on DOTr website.
49	Volume II of IV - PART 2 Employer's Requirements, ERT- 694, Table 8.8 Major specification of Limited Express Train (CP NS-03),	Please provide information about the train axle, wheels and coil spring characteristics, coupler (type, dimensions, drawings...)		The Bidder's request is rejected. This is an interface requirement with RS contractor. Interface shall be done during design stage with the RS contractor. For more details bidder may refer to bidding documents for Limited Express (CP NS-03) available on DOTr website.
50	Volume II of IV - PART 2 Employer's Requirements, ERT- 833, N18.06 Cooler Carrier,	It is indicated that the Cooler has about 700kg and two units should be carried (total 1400 kg) by the Cooler carrier. Additionally, the Cooler Carrier should be of movable type with casters. Those two requests seem to be not compatible together. The Employer is kindly requested to give information on this point and give more technical details about this equipment.		The Bidder's understanding is incorrect. Item N18.06 shall be supplied meeting with the employers stated requirement in the ERT. No change is required.
51	Volume II of IV - PART 2 Employer's Requirements, ERT- 886, 900, 917, N22.05 Hydraulic Press 30t; N23.04 Hydraulic Press 50t; N25.05 Hydraulic Press 30t,	,It is indicated that the Hydraulic Press should be "C" type. The hydraulic press portal type could answer to the requested performance. Please confirm if the portal type can be offered instead of the C type.		The Bidder's proposal is rejected. This is a design build contract. Any such changes can be proposed with proper technical justification to achieve the required equipment functionality and technical

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
				requirements as stated in the Bid document.
52	Volume II of IV - PART 2 Employer's Requirements, ERT-952, N71.01 Measuring Instruments, Gauges ee. 4 sets: Wheel measuring device, portable type. (measurement item: Wheel profile, diameter, clearance, etc.),	Please provide more technical details (functions, performance) on the Wheel measuring device, portable type.		Please refer to Annex B
53	Volume II of IV - PART 2 Employer's Requirements, ERT-952, N71.01 Measuring Instruments, Gauges ff. 1 set: Wheel load measuring devise, portable type,	Please provide more technical details (functions, performance) on the Wheel measuring device, portable type.		Please refer to Annex B
54	Volume II of IV - PART 2 Employer's Requirements, ERT-952, N71.01 Measuring Instruments, Gauges gg. 149 Sets: Laptop Computer ,	Please confirm if the number of computers to be provided is 149 units.		The Bidder's understanding is correct. 149 no. laptops as stated in item N71-01 in ERT 952 shall be supplied for Mabalacat Depot.
55	GBB no3 Part 3 – Conditions of Contract and Contract Forms Section VIII. Particular Conditions, PC-12, KD 2-4.1, Supply of On-board Equipment including all	The Employer is kindly requested to make available at MCRP depot, 1st CP NS-02 Contractor trainset equipped with On-board Equipment (including all accessories and fittings) at NTP + 24 in order to initiate SAT of		Reference to the Employer's Requirements - General Requirements item 20 [Interface Management], the Contractor shall interface with the CP NS-02 for the interface coordination for Rolling Stock's detail delivery schedule.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	accessories and fittings at the premises of the Rolling Stock Contractors in Japan/or elsewhere as advised. Supply to CP NS-02 Contractor for 1st trainset & CP NS-03 Contractor for trainsets 1-7 at NTP+27	the train-borne equipment, on Main Line test track		
56	Part 3 – Conditions of Contract and Contract Forms Section VIII. Particular Conditions, PC-12, KD 2-4.5, Supply of On-board Equipment including all accessories and fittings at the premises of the Rolling Stock Contractors in Japan/or elsewhere as advised.	Please confirm that Completion of the whole of works for Section 2 at NTP +37, whereas Supply of On-board Equipment including all accessories and fittings at the premises of the Rolling Stock Contractors in Japan/or elsewhere as advised for CP NS-02		Reference to the Employer's Requirements - General Requirements item 20 [Interface Management], the Contractor shall interface with the CP NS-02 for the information exchange.
57	Part 3 – Conditions of Contract and Contract Forms Section VIII. Particular Conditions, PC-13, Completion, Supply to CP NS-02 Contractor for trainsets 16 to 19 at NTP+40 Achievement: Completion of the	Those two sentences are contradictory. Please advise.		Please refer to the Annex B for the revised Attachment 1 - Summary of Key Dates.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	whole of works for Section 2 at NTP +37			
58	Part 3 – Conditions of Contract and Contract Forms Section VIII. Particular Conditions, PC-19, AD 1, The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages.	Please indicate the chainage/location and Month N° of availability of the remaining part of Trackway beyond the approximate length of 1km		Reference to the ERG Clause 20.9 - Construction Interfaces and Co-ordination, the Contractor shall coordinate with the Interface Contractors for the location of the remaining part of the viaduct. The bidder may refer to the AD 1.1.4, AD 1.2.4, AD 1.3.4, etc. for the Month number.
59	Part 3 – Conditions of Contract and Contract Forms Section VIII. Particular Conditions, PC-23, AD 5.5.1, Provision of access to OCC Annex (Central Equipment Building) including galleries/ducts	Please indicate Month N° of availability of OCC building in MCRP depot		The bidder may refer to the AD 5.5.4 for other facilities.
60	Part 3 – Conditions of Contract and Contract Forms	Please indicate Month N° of availability of OCC building in NSRP-South depot		Please refer to the Annex B for the Attachment 2

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	Section VIII. Particular Conditions, PC-30, AD 5.7.1, Provision of access to OCC Annex (Central Equipment Building) including galleries/ducts			- Time For Access To And Possession Of The Site.
61	Part 2 – Employer’s Requirements Section V1. Employer’s Requirements General Requirements, ERG-52, 10. INSPECTION, TESTING, AND COMMISSIONING, The Contractor shall be responsible for providing temporary electricity supply, all instruments, gauges, test equipment, tools, accessories, personnel, services, and necessary facilities required for the execution of all tests and inspection.	In the General Requirements of the RS RFP for CP NS-02 (RS Commuters), CP NS-03 (RS Limited Express) and CP 107 (MMSP Trains) it is specified that “train operation personal (train operators and rolling stock personnel) required for inspection, testing and commissioning including integrated testing and commissioning and trial run shall be borne by Contractor”. Please confirm that all needed train drivers for CP NS-01 contract will be provided by RS/Other Contractors.		The Bidder's understanding is correct.
62	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer’s Requirements March 2021, ERT-628, 7.7.2.3, "7.7.2.3 Generate the O&M	The security Key (or some time called the «Master Key" that enable to edit vending, validating, controlling. sub-keys) is highly confidential and should normally belong to the property of the «Department of Transportation". So, the indentation b) of the		The Bidder's understanding is incorrect. The Contractor shall demonstrate the key generation process and its related interface without compromising the security of the AFC system.

Annex A

[illegible]

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
		that during project execution such optimization will be possible to propose?		
64	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-624, 7.4.1.6 a), "The Contractor shall provide the initial quantity of SJT and SVC, subject to the approval of the Engineer. The Contractor shall ensure that the SJTs and SVCs provided are certified in accordance with the National Standard Specification of Transit Card (NS TC)."	Please communicate the «National Standard Specification of Transit Card (NS TC)" or give instruction on the type of cards that shall be considered for the bidding exercise.		The Contractor shall propose the card media type that is compliant with the AFC National Standard.
65	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-622, 7.3.3, "Table 7-3 Rules and Standards ... 'Business Rules	Please communicate the business rules document to take it into account into the frame of the bidding exercise.		The Business Rules is part of the AFC National Standard. A copy of the AFC National Standard shall be provided upon execution of Non-Disclosure Agreement with AFCS-PO/DOTr.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	A document designed for an interoperable transit network which accommodates multiple Automatic Fare Collection System (AFCS) operators and multiple Contactless Smart Medium (CSM) ISSUERS."			
66	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-622, 7.3.3, "Table 7-3 Rules and Standards ... (confidential) TranspoTM Automatic Fare Collection Scheme – Core Operating Rules"	Please confirm that the "TranspoTM Automatic Fare Collection Scheme – Core Operating Rules", does not impact in any manner with the Business Rules, so that the implementation of the interoperability model of Manilla can be correctly quoted for the bidding exercise.		Please refer to GBB5 Item 15.
67	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-622, 7.3.3, "Table	Please confirm that, due to confidential reason, the core operating rules already exist and will be disclosed under ndla at the contract signature.		Please refer to GBB5 Item 15.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	7-3 Rules and Standards ... "(confidential) TranspoTM Automatic Fare Collection Scheme – Core Operating Rules"			
68	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-622, 7.3.3, "National QR Code Standard Banko Sentral ng Philipinas (BSP) Standard on QR code"	Please provide the BSP standard on the QR code for a common understanding for all the bidders.		The BSP standard on QR code is part of the AFC National Standard. A copy of the AFC National Standard shall be provided upon execution of Non-Disclosure Agreement with AFCS-PO/DOTr.
69	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERG-181, APPENDIX 8- OUTLINE INTERFACE DEMARCATION WITH NSCR, "Discipline AFC ..."	The table clarifies that there is no direct interface between AFC CP104 and AFC NS01, only though the level 4. Please confirm the Bidder's understanding: "AFC NS01 (MSCR) and AFC NS01 (NSCR-South) are connected to the same level 4"		The Bidder's understanding is correct.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
70	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERG-185, APPENDIX 8-OUTLINE INTERFACE DEMARCATION WITH MMSP, "Discipline AFC Reconciliation will be done at Level 4. There will be no direct interface at Level 3 and below between NS-01 and CP106."	Please precise if the interface level 4 for MMSP purpose is the same than the one for NSCR purpose.		The Bidder's understanding is correct.
71	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERG 185, APPENDIX 8-OUTLINE INTERFACE DEMARCATION WITH MMSP, "Discipline AFC "Tickets purchased on NSCR stations including those for the Limited Express service shall enable passengers to alight at MMSP stations." "Tickets purchased on MMSP	Please confirm that, in the particular case of the "Limited Express Ticket", it is a specific instantiation already shared with all the AFC contractors and already in place, so that no interface activities with other AFC contractors (through the control of the department of transportation) have to be quoted for the bidding exercise.		The Contractor shall propose a Limited Express ticketing system that is interoperable with other interfacing transit lines and compliant with the AFC National Standard.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	stations shall enable passengers, including those taking the Limited Express Service to alight at NSCR stations."			
72	<p>PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS</p> <p>Volume II of IV / PART 2 Employer's Requirements</p> <p>March 2021, ERT-627, 7.7.1.1 f),</p> <p>"System Operational Requirements General</p> <p>Common Use Card</p> <p>General Requirements</p> <p>The card media shall be the same media used in the system of LRT1,2, MRT3</p> <p>(ISO/IEC14443 Type A or B) Shape of the card shall be credit card size;</p> <p>SJT: (85.47-85.72mm) × (53.92-54.03mm) × (0.50±0.05mm)</p> <p>SVC: (85.47-85.72mm) × (53.92-54.03mm) × (0.80±0.05mm)</p> <p>Base material of the card shall be PET or other types of that are</p>	<p>Please precise the type of the required cards: "SVC", similar to "Mifare" Desfire EV1 Type A or "Mifare" Desfire EV2 8k.</p>		<p>The Contractor shall propose a card media type that is compliant with the AFC National Standard</p>

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	environmentally benign when incinerated. Data retention period shall be at least 10 years for SVC and 5 years for SJT in normal use."			
73	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-627, 7.7.1.1 f), "System Operational Requirements General Common Use Card General Requirements The card media shall be the same media used in the system of LRT1,2, MRT3 (ISO/IEC14443 Type A or B) Shape of the card shall be credit card size; SJT: (85.47-85.72mm) × (53.92-54.03mm) × (0.50±0.05mm) SVC: (85.47-85.72mm) × (53.92-54.03mm) × (0.80±0.05mm)	Please precise the type of the journey tickets required: "SJT" or like "Mifare" type ultralight.		The Contractor shall propose a card media type that is compliant with the AFC National Standard.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	Base material of the card shall be PET or other types of that are environmentally benign when incinerated. Data retention period shall be at least 10 years for SVC and 5 years for SJT in normal use."			
74	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-627, 7.7.1.1 f), "System Operational Requirements General Common Use Card General Requirements The card media shall be the same media used in the system of LRT1,2, MRT3 (ISO/IEC14443 Type A or B) Shape of the card shall be credit card size; SJT: (85.47-85.72mm) × (53.92-54.03mm) × (0.50±0.05mm)	Please confirm, at the level of media, that "SVT" and "SVC" required (in the requirement 77.1.1 f) will be used and shared by all the AFC systems present into the community (LRT 1, LRT 2, MRT 3, project CP106, CP04, and future AFC systems).		The SJT and SVC will be a common ticketing system for all interfacing transit lines that are compliant with the AFC National Standard.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	SVC: (85.47-85.72mm) × (53.92-54.03mm) × (0.80±0.05mm) Base material of the card shall be PET or other types of that are environmentally benign when incinerated. Data retention period shall be at least 10 years for SVC and 5 years for SJT in normal use."			
75	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume III of IV PART 2 – EMPLOYER'S REQUIREMENTS DRAWING March 2021, N/A, N/A, Drawings	Please provide the drawings of "Buendia" and "Espana" stations.		Drawings for all stations are included in the tender and ITB 6.5
76	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-637, 7.7.9.3, "7.7.9.3 QR Code Payment Mobile based ticketing shall be used	The requirement mentions "Mobile-based tickets shall be based on secure QR code technology& NFC". QR code requirement is one technology. NFC is another one that is completely different compared to the QR code. Could you please clarify that the NFC is not related to the QR code payment and that NFC		The NFC and QR code are separate technologies. The Contractor shall propose a design that is best suited for NS-01 project and it shall be interoperable with interfacing transit lines and compliant with AFC National Standard.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	by commuters to book their tickets via mobile phone application. Mobile based tickets shall be based on secure QR code technology & NFC. The mobile application shall be integrated with a mobile wallet linked to the pre-paid account. The Contractor shall provide necessary software and interface to meet this requirement."	payment is a separate request. Otherwise could you please clarify the context of use since it is unusual and/or unknown.		
77	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-637, 7.7.9.3, "7.7.9.3 QR Code Payment Mobile based ticketing shall be used by commuters to book their tickets via mobile phone application. Mobile based tickets shall be based on secure QR code technology & NFC. The mobile application shall be integrated with a mobile wallet linked to the pre-paid account. The	The QR code payment is usually using existing mobile wallet services like "GCash", "PayMaya", "AliPay", "WeChatPay", etc.... Payment are done within the mobile payment service's mobile application so that the QR generated can be interfaced with the AFC system. Can you please advise if the QR payment service providers of the transportation authorities is already identified or chosen so that the AFC project on that specificity can start at the beginning of the project? Can you communicate the number of providers that need to be		The Contractor shall propose a design that is best suited for NS-01 project and it shall be interoperable with interfacing transit lines and compliant with AFC National Standard.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	Contractor shall provide necessary software and interface to meet this requirement."	consider for quotation purpose of the development?		
78	PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS Volume II of IV / PART 2 Employer's Requirements March 2021, ERT-637, 7.7.9.4, "7.7.9.3 QR Code Payment The system shall allow for the integration and operation of a mobile application-based ticketing. This shall be implemented & demonstrated in Test lab on one of the entries and one of the exit gates first before implementation at all stations. The Contractor shall be responsible for developing an end-to-end Issuance and Acceptance ecosystem including back end processing required for such ticketing needs."	As regarding the NFC payment and account based EMV payment. Can you please advise if the payment service providers such as "Apple Pay", "Google Pay", "Samsung Pay", and credit card service providers such as "VISA", "Master", "Amex", "JCB" are already identified and will be chosen per the transportation authority's at the beginning of the project so that the AFC project on that specificity can start ? Can you communicate the number of providers that need to be consider for quotation purpose of the development?		The Contractor shall propose a design that is best suited for NS-01 project and it shall be interoperable with interfacing transit lines and compliant with AFC National Standard.
79	Vol II, Part 2, ERT-339 Pg. 621, 2.2 Scope of supply for the	As internal zones are assumed to be indoors under shelter, IP rated speakers shall not be		Our bid conditions prevail.

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	Public Address (PA) System, Speakers located in internal zones shall be compliant with IP54. The frequency response shall be over the range of 100 Hz-15 kHz.	required. The frequency response over the range of 100Hz-15kHz is a very wide range which has no significant benefits and it can be considered to be oversizing the requirement. Having a range of 170Hz - 13kHz would allow more choices with a lower price. Please amend this requirement to request IP54 rating only for speakers located near to open areas prone to weather effects and consider the range of 170Hz - 13kHz for the frequency response.		
80	PART 3 - SECTION VIII - Particular Conditions, PC-26, Section 4 – AD-1, CP S-03(b) (10.7km) From km 14+800 to km 25+500	Please confirm that the south boundary of CP S-03(b) is km 19+596 and not km 25+500 - CP S-03(b) (4.796km) From km 14+800 to km 19+596		Please refer to Annex B.
81	PART 3 - SECTION VIII - Particular Conditions, PC-26, Section 4 – AD-1, CP S-03(c) (5.8km) From km 19+596 to km 25+412	Please confirm that the south boundary of CP S-03(c) is km 25+500 and not km 25+412 - CP S-03(c) (5.904km) From km 19+596 to km 25+500		Please refer to Annex B.
82	PART 3 - SECTION VIII - Particular Conditions, PC-26, Section 4 – AD-2, CP S-03(a)	Please confirm that the south boundary of CP S-03(c) is km 25+500 and not km 25+412 - CP S-03(c) (5.904km) From km 19+596 to km 25+500		Please refer to Annex B.

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

General Bid Bulletin No. 6

Annex A

Item No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response
	AD 2.3a.1: Receiving Sub-Stations No. S3 and S4			
83	Vol II, Sec.VI c),ERT-622,7.3.3,	Please provide the BSP standard on the QR code to be included in the contract. This will be the baseline for the QR code standard.		The BSP standard on QR code is part of the AFC National Standard. A copy of the AFC National Standard shall be provided upon execution of Non-Disclosure Agreement with AFCS-PO/DOTr.

Annex B

PACKAGE CP NS-01: E&M SYSTEMS AND TRACK WORKS
General Bid Bulletin No. 6
Annex B

ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
Volume I Part 1 – Bidding Procedures		
1	Section IV Bidding Forms Appendix 7.3 Proposed Method of Implementation of the Works item 3.5 Page BF-21	<u>Item 3.5 revised with the following:</u> “3.5 plan to make sure that spare parts and consumable parts will be available for the maintenance work defined in the Section VI – Employer’s Requirements;”
Volume II Part 2 – Employer’s Requirements		
2	ERG 18	New Cause added : Equipment that has been tested and approved for unconditional and unrestricted use on any passenger-carrying railway by any Railway administration may be exempted from fresh type approval test by the Engineer. However, for this exemption a viable certificate issued by the concerned Railway administration must be submitted to the Engineer for verification and acceptance. The Engineer’s decision will be final.
3	Item 71 of Annex A, GBB2 ERT 113, First paragraph, Clause 2.12.11	Added text: ‘ATO shall conform to SIL level as specified by European Union Agency for Railways (ERA) while publishing relevant subsets.’

4	ERT 125, Paragraph 4, Clause 2.17	Added text: 'Control of the Depot Signaling system shall be independent from the mainline CATS having a separate duplicated ATS server system with automatic switchover of control.'							
5	Chapter 8, Table 8.13, Special Equipment and Tools of the railway system and the rolling stock Page ERT-710 to 713	<u>Revised and updated Table 8.13 to be read as:</u>							
		Equip ment Group No.	Shop Name	Special Equipment and Tools	Supply				
		North Depot			CP NS- 01	CP NS- 02	CP NS- 03		
		N01	Light Repair Shop	On-board Signal equipment tester	✓				
				On-board Telecommunication equipment tester	✓				
				Re-writing devices for internal, external and public address display system	✓				
				Portable test unit for TMS (with software)		✓	✓		
				Portable test unit for Traction Controller (with software)		✓	✓		
				Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓		
				Portable test unit for Brake Control Unit (with software)		✓	✓		

				Portable test unit for Air Conditioning Unit (with software)		✓	✓
				Disc Brake replacing tool	✓		
				Handheld thermal imaging cameras	✓		
				Shock pulse and Vibration analysers for machines	✓		
				Real time wheel geometry measurement system	✓		
				Wheel measurement devices, portable, non-contact type	✓		
				Wheel measurement devices, portable, full-contact type	✓		
				Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
		N02	Unscheduled Repair Shop	Wheel load measuring device, portable (system for 4 axles)	✓		
		N13	Car Body Shop	Special tools for removal and installations of coach doors	✓		
		N16	Traction Motor Shop	Motor disassembling/reassembling tools	✓		
		N17	Bogie Shop	Bogie disassemble/reassemble special tools	✓		
		N18	Air conditioner Shop	Special tools for air conditioner overhaul	✓		
				Test Equipment for Air Conditioner Unit (ACU)		✓	✓
		N19		High voltage insulation tester	✓		

			Electric Parts Shop including Electronic Room	Contactor and High Speed Circuit Breaker (HSCB) tester	✓		
				Solenoid valve test bench	✓		
				Relay tester	✓		
				Door operating device tester	✓		
				On-board Signal equipment tester	✓		
				On-board Telecommunication equipment tester	✓		
				Speed sensor tester	✓		
				Electronic Worktables with ESD protection	✓		
				Soldering and de-soldering stations	✓		
				Multipurpose Power Supplies	✓		
				Digital Storage Oscilloscopes	✓		
		N22	Spring, Air Spring & Iron workshop	Special tools for air-spring overhaul	✓		
				Special tools for damper overhaul	✓		
		N23	Tight Lock Coupler and Draft Gear Shop	Special tool for draft gear	✓		
		N25	Air Brake Valve Shop	Test equipment for Brake Control Unit		✓	✓
				Brake valve test bench	✓		

				Special tools for air valve overhaul	✓		
				Special tools for compressor overhaul	✓		
		N31	Final Adjustment Shop	On-board Signal equipment tester	✓		
				On-board Telecommunications equipment tester	✓		
				Wheel measurement devices, portable, non-contact type	✓		
				Wheel measurement devices, portable, full-contact type	✓		
				Wheel load measuring device, portable type (system for 4 axles)	✓		
				Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
				Portable test unit for TMS (with software)		✓	✓
				Portable test unit for traction controller (with software)		✓	✓
				Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
				Portable test unit for Brake control unit (with software)		✓	✓
				Portable test unit for Air Conditioning Unit (with software)		✓	✓

		Equip ment Group No.	Shop Name	Special Equipment and Tools	Supply		
		South Depot			CP NS- 01	CP NS- 02	CP NS- 03
		S01	Light Repair Shop	On-board Signal equipment tester	✓		
				On-board Telecommunication equipment tester	✓		
				Re-writing devices for internal, external and public address display systems	✓		
				Portable test unit for TMS (with software)		✓	✓
				Portable test unit for traction controller (with software)		✓	✓
				Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
				Portable test unit for Brake control unit (with software)		✓	✓
				Portable test unit for Air Conditioning Unit (with software)		✓	✓
				Disc Brake replacing tool	✓		
				Handheld thermal imaging cameras	✓		
				Shock pulse and Vibration analysers for machines	✓		
				Real time wheel geometry measurement system	✓		

				Wheel measurement devices, portable, non-contact type	✓		
				Wheel measurement devices, portable, full-contact type	✓		
				Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
		S02	Unschedule d Repair Shop	Wheel measurement devices, portable, non-contact type	✓		
				Wheel measurement devices, portable, full-contact type	✓		
				Wheel load measuring device, portable type (system for 4 axles)	✓		

6	<p>Chapter 8, N71 Tools. N71.01: Measuring Instruments, Gauges Page ERT-952 to 954</p> <p>New section N71.03 added.</p>	<p><u>Revised and updated N71.01. Refer annexure B1</u></p> <p><u>Item ee deleted as added in N71.03</u> <u>Item ff deleted as added in N71.03</u> <u>Item gg to be read as:</u></p> <p>149 sets: Laptop Computer (Minimum indicative specifications RAM: 8GB, SDD: 500GB, 15.6” Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)</p> <p><u>Added section N71.03 for Special Equipment and tools to be read as:</u></p> <p>N71.03 Special Equipment and Tools</p> <p>1. Quantity: One (1) lot The following special tools shall be supplied, but not limited to;</p> <p>a. Wheel measurement devices, portable, non-contact type: 4 sets b. Wheel measurement devices, portable, full contact type: 4 sets</p>
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		<ul style="list-style-type: none"> c. Wheel load measuring device, portable type (system for 4 axles): 2 sets d. Real time wheel geometry measurement system: 1 set e. On-board Signal equipment tester: 4 sets f. On-board Telecommunication equipment tester: 4 sets g. Re-writing devices for internal, external and public address display systems: 4 sets h. Disc Brake replacing tool: 4 sets i. Handheld thermal imaging cameras: 4 sets j. Shock pulse and Vibration analyzers for machines: 2 sets k. Special tools for removal and installations of coach doors: 8 sets l. Motor disassembling/reassembling tools: 4 sets m. Bogie disassemble/reassemble special tools: 4 sets n. Special tools for air conditioner overhaul: 4 sets o. High voltage insulation tester: 2 sets p. Contactor and High-Speed Circuit Breaker (HSBC) tester: 1 set q. Solenoid valve test bench: 1 set r. Relay tester: 1 set s. Door operating device tester: 4 sets t. Speed sensor tester: 2 sets u. Electronic Worktables with ESD protection: 10 sets v. Soldering and de-soldering stations: 10 sets w. Multipurpose Power Supplies: 10 sets x. Digital Storage Oscilloscopes: 10 sets y. Special tools for Air-spring overhaul: 4 sets z. Special tools for Damper overhaul: 4 sets aa. Special tool for Draft gear: 4 sets bb. Brake valve test bench: 1 set cc. Special tools for air valve overhaul: 2 sets dd. Special tools for Compressor overhaul: 2 sets ee. Handheld battery-operated Oscilloscope with DMM and Power analyzer: 2 sets
		2. Functional Requirements: Tools/equipment/facilities for Rolling stock maintenance

		<p>that is assumed not to be procured at general commercial markets are treated as special tools and test equipment of the Railway system and Rolling stock. Special tools and test equipment are to be planned and supplied in close consultation and interfacing with Rolling Stock supplier and other Railway systems vendors at appropriate time with approval of Engineer.</p> <p>2.1. Actual requirement and specifications shall be reviewed and finalized as per the maintenance requirement of the Rolling stock on NSCR.</p> <p>2.2. Design: Indicated specifications below are for reference only and actual design and specifications may vary and depend upon final Rolling stock design and maintenance requirement.</p> <p>a. Wheel measuring devices, portable type, non-contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement, etc.</p> <p>i. Portable device consists of equipment for precise measuring of the entire wheel that uses laser to complete without contact.</p> <p>ii. The sensor consists of multiple lasers and is housed in an appropriate IP casing that is connected to a computer/tablet PC unit when taking the measurements. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the CMMS.</p> <p>iii. RS identification (train, car, bogie, wheel location, date and technician ID's) can be input as related measurements.</p> <p>iv. Reference standards shall be provided for automatic re-calibration.</p> <p>b. Wheel measuring devices, portable type, full contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement etc.</p>
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		<ul style="list-style-type: none"> i. Portable device consists of equipment for precise measuring of the entire wheel that uses full contact measurement system with optical encoders and Bluetooth/WiFi connectivity for data transmission to PDA/Tablet. ii. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the CMMS. iii. Reference standards shall be provided for automatic re-calibration. <p>c. Wheel load measuring device, portable type (system for 4 axles)</p> <ul style="list-style-type: none"> i. Portable contact force measuring each wheel load of one EMU (8wheel/car) at the same time to confirm the wheel load distribution and deviation required by the EMU maintenance manual are to be within acceptable range. ii. Measurement results shall be recorded and indicated in the panel with alarm when load deviation exceeds the range. Result of each car shall be consolidated into one data file for one train and stored in the system, can download via USB and can be integrated to CMMS. iii. The system shall be installed in the entrance rails of the Final Adjustment Shop and Unscheduled Repair Shop and design shall consider self-propulsive condition of EMU such as the effect of return current. iv. It shall be designed for bogie distance of 13,800mm, wheel base 2,100mm and axle load max. approx. 16 tons. v. Measurement shall be capable on stopping condition with accuracy shall be within +/- 500mm. One axle measurement shall be possible. vi. Close interface shall be taken with Rolling Stocks contractors to confirm design and performance conditions. <p>d. Real time wheel geometry measurement system</p> <ul style="list-style-type: none"> i. The system is for contactless automatic measurement of geometrical parameters of railway wheels and uses a combination of 2D/3D laser scanners, mounted wayside in the track area. ii. The system is intended to perform the following but not limited to;
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		<ul style="list-style-type: none"> iii. Vehicle detection and identification– to detect train and identify train number. iv. Wheel Profile Measuring – to measure wheel profile and derived parameters (flange height, flange thickness, flange slope, root wear, wheel tread hollow, wheel flatness, wheel rim thickness, flange rollover, tread rollover, wheel diameter, wheel width, back-to-back distance etc.) v. All measurement readings for all the wheels are sent through Ethernet to control computer for profiles reconstruction and dimensions calculations. Finally, all the data are collected in the host depot computer in wheel sets wear database and linked to CMMS servers/workstation in Depot. Data shall be available and can be linked in NSRP depots. vi. Close interface shall be taken with all systems in NSRP lines. vii. Calibration tools shall be part of the contractor to supply. <ul style="list-style-type: none"> e. On-board Signal equipment tester – system used to test on board signaling equipment while on-board train and or station. Precision handheld RF transmission lines and antenna tester return loss/SWR and fault location measurement instrument, with frequency coverage. Close interface shall be taken with necessary interfacing parties for design and performance conditions. f. On-board Telecommunication equipment tester- system used to test on board Telecommunication equipment while on-board train and or at station. Close interface shall be taken with necessary interfacing parties for design and performance conditions. g. Re-writing devices for internal, external and public address display systems - Portable handheld devices to diagnose, modify and monitor the functional data and software of various display systems in the rolling stock to suit the operational and maintenance requirements. Close interface with interfacing parties for design and performance conditions.
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		<p>synchronous measurement, Stroboscope input/output for rpm measurement, Download thousands of measuring points, Current and voltage input, 0 –20 mA / 0 –10 V, Motor current analysis, Speed measurements 1– 120 000 rpm, Stethoscope function, earphones, 4.3” TFT colour display with automatic back light, Programmable function keys, One hand operation, right or left, Accepts IEPE standard vibration transducers, Carbon-fiber-reinforced enclosure, IP65.</p> <p>k. Special tools for removal and installations of coach doors – shall be provided to enable door leaf removal and installation from/to the vehicles. Shall be designed to be used with overhead crane, forklift and pallet carrier. Close interface shall be taken with Rolling Stock contractors and NS-01 contractor for the design and performance conditions.</p> <p>l. Motor disassembling/reassembling tools – they shall be used for dismantling and reassembling tool of traction motor. Shall be composed but not limited to:</p> <ul style="list-style-type: none"> i. Alignment check tool used to indicate displacement of traction motor and gear unit. ii. Pinion heater to enable installation of bearing by expansion. iii. Bearing puller and pusher tools. <p>m. Bogie disassemble/reassemble special tools – they shall be used to disassemble and reassemble bogies for maintenance utilization and shall be composed of the following but not limited to:</p> <ul style="list-style-type: none"> i. Go No type gauges for important bogie frame dimensions and clearances. ii. Lifting tool for bogie frame, traction motor and radius arm. Also to include lifting tool for air spring and wheelset. iii. Tool for setting primary spring (e.g. primary spring press for bogie assembly, gauge for wheelbase and parallelism of axles and stand for axle box)
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		<ul style="list-style-type: none"> iv. Caster for gear box to allow smooth movement in workshop of wheel set. v. Close interface shall be taken with Rolling Stocks contractors and NS-01 contractor for design and performance conditions. <p>n. Special tools for Air Conditioner Unit (ACU) overhaul – the system shall be used to lift ACU and ACU evaporator cover to utilize maintenance. Shall composed of but not limited to:</p> <ul style="list-style-type: none"> i. Air conditioning unit and cover lifting beams ii. Air conditioning storage rack iii. Items shall be cross checked to N18 Air Conditioner Shop equipment iv. Close interface shall be taken with Rolling Stocks contractors and NS-01 contractor for design and performance conditions. <p>o. High Voltage Insulation Tester – is a device performs insulation resistance testing up to 10 kV. The Insulation Resistance (IR) test is a quantitative test, which indicates the effectiveness of a product's electrical insulation. Applications include cables, transformers, motors, circuit breakers and bushings. Common insulation tests are the “spot test”, a 1-minute IR test and a 10-minute Polarisation Index (PI) test, where PI is the ratio R_{10min} / R_{1min} and is temperature independent. Basic features of the device shall be as follows but not limited to:- Automatic insulation resistance testing polarisation index (PI), dielectric absorption ratio (DAR), step voltage (SV) dielectric discharge (DD) and a ramp test, Insulation test voltages from 50 V to 10 kV for maximum flexibility, Insulation resistance measurement up to 20 TΩ, Guard terminal function available to eliminate surface current effect, High charge current available for measurement of inductive loads, High noise immunity, optical isolation between the operator and the HV circuit, Diagnostic functionality, Rechargeable battery and a.c. mains operation, On-board test result storage, 10 kV isolated USB interface to make real time downloading of test data and stored information to asset management software, Accessories double insulated 10 KV clip lead set with clamps in 5,</p>
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		<p>10, 15 m length, a transport case to store device along with standard lead sets. Ingress protection class IP 65.</p> <p>p. Contactor and High-Speed Circuit Breaker (HSCB) tester – the system shall be used to maintenance for contactors and HSCB. The system shall measure but not limited to:</p> <ul style="list-style-type: none"> i. Contact timing test, contact travel characteristics for speed, contact gap, over travel, bounce etc., Static and dynamic resistance measurement, records trip/close , holding coil current measurement, separate timing channels for measurement of auxiliary contact, Analog measurement channels for travel transducers or general voltage/current measurements, programming the current wave form and checking tripping or the circuit breaker in different test conditions. USB interface for communication with a PC. Inbuilt printer for test results. ii. Close interface shall be taken within Rolling stock contractors for the design and performance conditions. <p>q. Solenoid valve test bench – indicative tests to be performed on rolling stocks shall be: Proof Pressure Test, Seat Leak Test, Reverse Seat Leak Test, Coil Voltage Test, Coil Current Test, High Frequency Cycling, Coil Resistance or Impedance Test, Port Flow Test, Self-Test. Interchangeable valve adapters to be provided to permit multiple valve models to be tested on a single machine. A PLC controlled with graphical colour touch screen operator interface for easy operation and operator training to be provided. Test data logging, network interface, bar code scanning and part marking shall be included. Safety features to include light curtain guards, dual hand switches, pressure relief valves and explosion shields if required.</p> <p>r. Relay tester – Portable relay test system design to facilitate rapid verification of various Rollick stock relay condition. The system is battery powered (lasts 8 hours standard use) and allows the operator to perform tests on both instantaneous and timer relays. Efficiently determine correct relay</p>
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		<p>functionality including minimum operating voltage, contact quality and delay times. Defects such as jammed contacts are identified. Easy and quick operation: insert relay, select coil voltage, contact current and delay mode (timer relays only). After pressing start button within 3 seconds relay tester shows pass/fail result by a green/red LED. Including contact wetting possibility to electrically clean relay contacts the system shall be used to test relays functionality, confirming relay operation and targets during normal fault clearing conditions. All measurements shall be able record or can be downloaded via USB. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.</p> <p>s. Door operating device tester – the system shall be used to confirm set values of obstacle detection is within allowed range. This can be ranges of obstacle detection test bars. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.</p> <p>t. Speed sensor tester: It consists of two test modules. One module is a portable PDA/Tablet based field unit and other is a Test room bench. Its function is to test and calibrate various speed sensors/ pulse generators of the Rolling stock used for sensing train speeds. The field tester is used for testing and calibration of speed sensor/pulse generator on board train. By using keypad, it generates the pulses by programming various parameters like wheel diameter (WD), Pulses Per Revolution (PPR), Acceleration and KMPH as per requirement. 110 V DC supply of EMU can be used as power source to field tester and provision of suitable connector with cable set are provided. The test room bench shall be micro-processor/PLC based panel for simulation, testing and calibration of all speed sensors/ pulse generators of the Train. The system shall work in three modes i.e. Auto mode, Manual mode, PC mode. To test and calibrate sensor/pulse generator, test panel shall have following features.</p> <p>i. DC drive with high torque DC Motor with Variable speed drive control.</p> <p>ii. Digital RPM Counters.</p>
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		<ul style="list-style-type: none"> iii. Two modes of speed selections Fine and Coarse. iv. Sensor/PG Fixation base. v. Variable 0-150 V dc power supply. vi. Calibration, recording of speed and acceleration calibration data in the PC with suitable interface. vii. Suitable interfacing shall be done with Rolling stock and Signaling contractors to obtain design feature of train speed sensors. <p>u. Electronic Worktables with ESD protection – the system is used for repair of the Electrostatic Sensitive Devices which is undertaken in an Electrostatic Discharge Protected Area (EPA). These special purpose workstations are part of EPA and helps in preventing any static build up that could damage the component being handled / repaired. Every surface of the EPA workstation, that the ESD could come into contact with, is conductive and is earthed. This will include a footwear test and a wristband test, which will have dedicated testing stations for ease of use. Cleaning of the components may be undertaken using a dedicated cleaning station, which may form part of the EPA workstation. Following accessories will be part of the EPA workstation kit: Cleaning wipes, Spare wristbands, Conductive chair, Ionised air gun, Power unit, Storage shelf, Antistatic workbench, Draw unit, Top shelf, Wrist strap test point, Footwear test station, Lab coat, Anti-static work boots, Heel clips, Field Service Kit, Trolley Anti-static bag (0.1m²), Anti-static bag (0.5m²), Conductive transit box (0.15m²), Conductive transit box (0.35m²).</p> <p>v. Soldering and de-soldering stations – are benchtop machines with controls for adjusting heat setting to suit workpieces and one of more hand pieces to handle solder. This must be a dual purpose 2 in 1 soldering and de-soldering station with PID based programmable temperature control features.</p> <p>w. Multipurpose Power Supplies: Regulated AC/ DC voltage and current power supplies required for trouble shooting and repair of electronic items and PCB cards of Rolling stock equipment. These are to be used on the Electronic</p>
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		<p>worktables in the Electrostatic Discharge Protected Area (EPA) in the Electronic shop. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.</p> <ul style="list-style-type: none"> x. Digital Storage Oscilloscopes – the device shall be used to measure various system signals from high voltage to ultra low voltage simultaneously. Generate and record waveforms with a single unit. It shall have following features but not limited to: Bandwidth: 200 MHz with 2 GS/s sampling rate. Record length 5M on all channels. Up to 4 analog channels 32 automated measurements with FFT function for quick waveform analysis. Output previously recorded problematic waveforms and apply to devices under test to simulate potential issues. Large capacity memory. 200 MHz, 10x passive probe (one per analog channel), USB, LAN and Wi-Fi interface, standard calibration certificate. y. Special tools for Air-spring overhaul – These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of Air springs on the rolling stock bogies. z. Special tools for Damper overhaul: - These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of dampers on the rolling stock bogies. aa. Special tool for Draft gear: - These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of Draft gears on the rolling stock cars. bb. Brake valve test bench – the system is to measure the performance of the various brake and other valves of the rolling stock pneumatic system. <ul style="list-style-type: none"> i. System is to measure test item (i.e. brake control unit, electro-pneumatic change relay valve, variable load valve, bypass check valve, reducing valve, levelling valve, differential pressure valve, pressure switch and
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		<p>safety valves etc.). Actual type of valves to be tested and their test requirement will depend upon pneumatic system design on the Rolling stock.</p> <ul style="list-style-type: none"> ii. Test equipment is controlled by programmable logic controller (PLC) and the control equipment. Operation and the display are controlled by touch panel display. iii. Close interface shall be taken with Rolling Stocks contractors for design and performance conditions. iv. Suitable USB, LAN and WIFI connectivity to be provided for data connectivity to CMMS workstations and server. <p>cc. Special tools for air valve overhaul: - They should cover all special tools, jigs and fixtures required for dismantling, repair, overhaul, testing and reassembly on the rolling stock.</p> <p>dd. Special tools for compressor overhaul – they shall be used to utilize for maintenance of air compressor and shall be composed but not limited to:</p> <ul style="list-style-type: none"> i. Dial gauge, test indicator, taper gauge and special base holder ii. Special hexagon wrench, gear wrench, torque wrench iii. Special head for torque wrench, grease gun, bearing puller iv. Compressor suspension jig (with eyebolt and mounting bolt) v. Motor bearing insert jig and bearing heater vi. Valve lapping arrangement. vii. Close interface shall be taken within Rolling stock contractors for the design and performance conditions. <p>ee. Handheld battery-operated Oscilloscope with DMM and power analyzer functions – the system shall be used for electrical and power electronics measurements. It shall combine a full featured real-time oscilloscope with a True RMS digital multimeter in rugged, battery-operated instruments. Scope and meter modes can operate simultaneously and independently on the same or separate signals. Basic features are as follows but not limited to:</p>
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		<ul style="list-style-type: none"> i. It shall allow testing and verifying correct operation of motors, efficiency, verifying power supply performance and measuring the effect of neutral current. ii. It shall have dual channel 100 MHz dual channel oscilloscope function to enable troubleshooting and verification of electronic control circuits. iii. It shall be able to measures Harmonics up to 31st (Fundamental from 30 Hz to 450 Hz) iv. Automatic Power Measurement with Statistics v. Advanced Trigger – Delay, Pulse, Video (Line Count and Field Select), PWM Motor Drive vii. Accessories shall include but not limited to tough case and 1 kV High-voltage Probes.
7	<p>Chapter 8, S71 Tools. S71.01: Measuring Instruments, Gauges Page ERT-1004 to 1006</p> <p>New section S71.03 added.</p>	<p><u>Revised and updated S71.01. Refer annexure B1</u></p> <p><u>Item bb deleted as added in S71.03</u> <u>Item cc deleted as added in S71.03</u> <u>Item dd to be read as:</u></p> <p>41 sets: Laptop Computer (Minimum indicative specifications RAM: 8GB, SDD: 500GB, 15.6” Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)</p> <p><u>Added section S71.03 for Special Equipment and tools to be read as:</u></p> <p>S71.03 Special Equipment and Tools</p> <p>1. Quantity: One (1) lot</p> <p>The following special tools shall be supplied, but not limited to;</p> <ul style="list-style-type: none"> a. Wheel measurement devices, portable, non-contact type: 2 sets b. Wheel measurement devices, portable, full contact type: 2 sets c. Wheel load measuring device, portable type (system for 4 axles): 1 set

		<ul style="list-style-type: none"> d. Real time wheel geometry measurement system: 1 set e. On-board Signal equipment tester: 1 set f. On-board Telecommunication equipment tester: 1 set g. Re-writing devices for internal, external and public address display systems: 4 sets h. Disc Brake replacing tool: 1 set i. Handheld thermal imaging cameras: 1 set j. Shock pulse and Vibration analyzers for machines: 1 set k. Handheld battery-operated oscilloscope/DMM/power analyzer: 1 set <p>2. Functional Requirements: Tools/equipment/facilities for rolling stock maintenance that is assumed not to procure at general commercial markets are treated as special tools and test equipment of the railway system and rolling stock. Special tools and test equipment are to be planned and supplied in close consultation and interfacing with Rolling Stock supplier and other railway systems at appropriate time with approval of Engineer.</p> <p>2.1. Actual requirement and specifications shall be reviewed and finalized as per the maintenance requirement of the NSCR Rolling stock.</p> <p>2.2. Design: These specifications are for reference only and actual design and specifications may vary and depend upon final rolling stock design and requirement.</p> <ul style="list-style-type: none"> a. Wheel measuring devices, portable type, non-contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement, etc. <ul style="list-style-type: none"> i. Portable device consists of equipment for precise measuring of the entire wheel that uses laser to complete without contact. ii. The sensor consists of multiple lasers and in housed in an appropriate IP casing that is connected to a computer/tablet PC unit when taking the measurements. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the MMS. iii. RS identification (train, car, bogie, wheel location, date and technician
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		<p>ID's) can be input as related measurements.</p> <p>iv. Reference standards shall be provided for automatic re-calibration.</p> <p>b. Wheel measuring devices, portable type, full contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement etc.</p> <p>i. Portable device consists of equipment for precise measuring of the entire wheel that uses full contact measurement system with optical encoders and Bluetooth/WiFi connectivity for data transmission to PDA/Tablet.</p> <p>ii. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the MMS.</p> <p>iii. Reference standards shall be provided for automatic re-calibration.</p> <p>c. Wheel load measuring device, portable type (system for 4 axles)</p> <p>i. Portable contact force measuring each wheel load of one EMU (8wheel/car) at the same time to confirm the wheel load distribution and deviation required by the EMU maintenance manual are to be within acceptable range Contains one pair of load cells for each axle, with a total of four measurement sections to provide total weight measurement of a single twin-bogie vehicle.</p> <p>ii. Measurement results shall be recorded and indicated in the panel with alarm when load deviation exceeds the range. Result of each car shall be consolidated into one data file for one train and stored in the system, can download via USB and can be integrated to CMMS.</p> <p>iii. The system shall be installed in the entrance rails of the Light Repair Shop Unscheduled Repair Shop and design shall consider self-propulsive condition of EMU such as the effect of return current.</p> <p>iv. It shall be designed for bogie distance of 13,800mm, wheel base 2,100mm and axle load max. approx. 16 tons.</p> <p>v. Measurement shall be capable on stopping condition with accuracy shall be within +/- 500mm. One axle measurement shall be possible.</p>
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		<p>vi. Close interface shall be taken with Rolling Stocks contractors to confirm design and performance conditions.</p> <p>d. Real time wheel geometry measurement system</p> <p>i. The system is for contactless automatic measurement of geometrical parameters of railway wheels and uses a combination of 2D laser scanners, mounted wayside in the track area.</p> <p>ii. The system is intended to perform the following but not limited to;</p> <p>iii. Vehicle detection and identification – to detect train and identify train number.</p> <p>iv. Wheel Profile Measuring – to measure wheel profile and derived parameters (flange height, flange thickness, flange scope, root wear, wheel tread hollow, wheel rim thickness, flange rollover, tread rollover, wheel diameter, wheel width, back-to-back distance).</p> <p>v. All measurement readings for all the wheels are sent through Ethernet to control computer for profiles reconstruction and dimensions calculations. Finally, all the data are collected in the host depot computer in wheel sets wear database and linked to CMMS servers/workstation in Depot. Data shall be available and can be linked in NSRP depots.</p> <p>vi. Close interface is necessary with all systems in NSRP lines.</p> <p>vii. Calibration tools shall be part of the contractor to supply.</p> <p>e. On-board Signal equipment tester – system used to test on board signaling equipment while on-board train and or station. Precision handheld RF transmission lines and antenna tester return loss/SWR and fault location measurement instrument, with frequency coverage. Close interface shall be taken with necessary interfacing parties for design and performance conditions.</p> <p>f. On-board Telecommunication equipment tester - system used to test on board Telecommunication equipment while on-board train and or at station.</p>
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		<p>Close interface shall be taken with necessary interfacing parties for design and performance conditions.</p> <p>g. Re-writing devices for internal, external and public address display systems - Portable handheld devices to diagnose, modify and monitor the functional data and software of various display systems in the rolling stock to suit the operational and maintenance requirements. Close interface with interfacing parties for design and performance conditions.</p> <p>h. Disc Brake replacing tool – They shall be used to utilize maintenance for disc brake unit. Shall be composed but not limited to: (i.e. Hydraulic press assembly, pin guide, jigs, special wrenches, set of wrenches). Close interface shall be taken with Rolling Stock contractors for design and performance conditions.</p> <p>i. Handheld thermal imaging cameras – Uses thermal imaging to locate electrical, mechanical problems, hot spots and other heat issues before they turn into costly failures & production downtime or electrical fires. It shall be used for thermal scanning of electrical circuits, panel boards, components, motor control cabinets, breaker panels for non-contact thermal images and temperature measurements to assess equipment and circuit conditions. IR Resolution – 172,800 pixels (480 × 360), Remote Control and Streaming Video via Wi-Fi. Accuracy – Calibrated within +/- 2°C or +/- 2% of reading, Temperature range -40°C to 650°C, Thermal sensitivity <0.04°C at 30°C, Digital Zoom 4X Continuous or better, Image Storage 1000 radiometric JPEG images (SD card memory), Focus- Manual or Automatic (one shot). Accessories shall include: SD Memory Card, 100-260V AC adaptor/charger, two Li-Ion rechargeable batteries, 2-bay battery charger, power supply (with multi-plugs), Software, USB cable, video cable, Bluetooth® headset, lens cap, neckstrap, and hard case.</p>
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		<p>j. Shock Pulse Meter and Vibration Analyzer for rotating machines: - Shock Pulse Meter (SPM) cum Vibration analyser is a handheld device for a fast, easy, and reliable diagnosis of the operating condition of rolling element bearings of traction and other auxiliary motors of Rolling stock. It shall provide easy-to-understand condition evaluation in a green-yellow-red scale, as well as crystal-clear spectrums and time signals for further analysis. Basic features are as follows: Three channel simultaneous vibration monitoring. Frequency range DC to 40 kHz, Dynamic range >100 dB, 24 bit AD, Up to 25600 line FFT spectrum, Pre-fault symptoms for spectrum analysis, Simultaneous recording for up to 50 hours, Enveloping, true zoom, synchronous measurement, Stroboscope input/output for rpm measurement, Download thousands of measuring points, Current and voltage input, 0 –20 mA / 0 –10 V, Motor current analysis, Speed measurements 1– 120 000 rpm, Stethoscope function, earphones, 4.3” TFT colour display with automatic back light, Programmable function keys, One hand operation, right or left, Accepts IEPE standard vibration transducers, Carbon-fiber-reinforced enclosure, IP65</p> <p>k. Handheld battery-operated Oscilloscope with DMM and power analyzer functions– the system shall be used for electrical and power electronics measurements. It shall combine a full featured real-time oscilloscope with a True RMS digital multimeter in rugged, battery-operated instruments. Scope and meter modes can operate simultaneously and independently on the same or separate signals. Basic features are as follows but not limited to:</p> <ul style="list-style-type: none"> i. It shall allow testing and verifying correct operation of motors, efficiency, verifying power supply performance and measuring the effect of neutral current. ii. It shall have dual channel 100 MHz dual channel oscilloscope function to enable troubleshooting and verification of electronic control circuits. iii. It shall be able to measures Harmonics up to 31st (Fundamental from 30 Hz to 450 Hz) iv. Automatic Power Measurement with Statistics
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		v. Advanced Trigger – Delay, Pulse, Video (Line Count and Field vi. Select), PWM Motor Drive vii. Accessories shall include but not limited to tough case and 1 kV High-voltage Probes.
8	ERT 1021, 1022 Clause 10.1.4 (1) Table 10.2	Item 26 Sucat station: Replaced Sets 2 by 4 and Replaced Doors 64 by 128 Item 32 Santa Rosa Station: Replaced Sets 2 by 4 and Replaced Doors 64 by 128
Volume IV Part 3 – Conditions of Contract and Contract Forms		
9	Section VIII Particular Conditions Contract Data Page PC-3 and PC-4	Time for Completion revised as shown in the attachment to this Annex B.
10	Section VIII Particular Conditions Contract Data Table: Summary of Sections Page PC-8	Summary of Sections revised as shown in the attachment to this Annex B.
11	Section VIII Particular Conditions Attachment 1 Summary of Key Dates Page PC-10 to PC-17	Summary of Key Dates revised as shown in the attachment to this Annex B.
12	Section VIII Particular Conditions Attachment 2	Time for Access to and Possession of the Site revised as shown in the attachment to this Annex B.

	Time for Access to and Possession of the Site Page PC-18 to PC-31	
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Annex B – Attachment 1

APPENDIX 7.3: PROPOSED METHOD OF IMPLEMENTATION OF THE WORKS

1. The Bidder's proposed method of implementation of the Works shall comply or, subject to reasonable development, be capable of complying with the Employer's Requirements in all respects. The Bidder's proposals shall demonstrate such compliance and shall establish firmly the intended design and methodology, and compliance with the Technical Requirements for the E&M Systems and Track Works, including training and knowledge transfer.
2. For the purpose of the evaluation of the Bid submission, the Bidder shall provide a detailed method of implementation of the Works including, but not limited to, the data and/or documents referred to in the following sections.
3. **General Approach for System Integration and System Assurance**
 - 3.1 plan, organization and methodology to approach system integration for compliance with the Employer's Requirements;
 - 3.2 plan to comply with requirements for disaster/fire prevention and control;
 - 3.3 plan to comply with RAMS and Electromagnetic Compatibility;
 - 3.4 calculation of Life Cycle Cost for each Railway System subsystem for its design life;
 - 3.5 plan to make sure that spare parts and consumable parts will be available for the maintenance work defined in the Section VI – Employer's Requirements;
 - 3.6 plan, organization and methodology to approach knowledge/skill transfer for maintenance and operation of Railway Systems during construction, testing and commissioning; and
 - 3.7 approach for development of train operation plan:
 - 3.7.1 calculation of transport capacity of the Railway System corresponding to the demand forecast through the design life as defined in Section VI the Employer's Requirements;
 - 3.7.2 calculation of trip time from Calamba Station to Clark International Airport Station and in the reverse direction without boarding and alighting time at stations; and
 - 3.7.3 calculation or simulation to comply with the minimum headway at terminal stations and turn back stations.
 - 3.8 Methodology for Testing & Commissioning, Verification & Validation and Hazard log management.
4. **Design, Manufacture, Installation and Construction Method of Each System**
 - 4.1 Provision of the following data and/or documents on Track Works:

APPENDIX 7.3: PROPOSED METHOD OF IMPLEMENTATION OF THE WORKS

1. The Bidder's proposed method of implementation of the Works shall comply or, subject to reasonable development, be capable of complying with the Employer's Requirements in all respects. The Bidder's proposals shall demonstrate such compliance and shall establish firmly the intended design and methodology, and compliance with the Technical Requirements for the E&M Systems and Track Works, including training and knowledge transfer.
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 - 3.1 plan, organization and methodology to approach system integration for compliance with the Employer's Requirements;
 - 3.2 plan to comply with requirements for disaster/fire prevention and control;
 - 3.3 plan to comply with RAMS and Electromagnetic Compatibility;
 - 3.4 calculation of Life Cycle Cost for each Railway System subsystem for its design life;
 - 3.5 plan to make sure that spare parts and consumable parts will be available for the maintenance work ~~for at least five (5) years following completion of the whole of the Works~~defined in the Section VI – Employer's Requirements;
 - 3.6 plan, organization and methodology to approach knowledge/skill transfer for maintenance and operation of Railway Systems during construction, testing and commissioning; and
 - 3.7 approach for development of train operation plan:
 - 3.7.1 calculation of transport capacity of the Railway System corresponding to the demand forecast through the design life as defined in Section VI the Employer's Requirements;
 - 3.7.2 calculation of trip time from Calamba Station to Clark International Airport Station and in the reverse direction without boarding and alighting time at stations; and
 - 3.7.3 calculation or simulation to comply with the minimum headway at terminal stations and turn back stations.
 - 3.8 Methodology for Testing & Commissioning, Verification & Validation and Hazard log management.
4. **Design, Manufacture, Installation and Construction Method of Each System**

BIDDING DOCUMENTS

FOR

PROCUREMENT OF

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

WORKS

Volume II of IV

PART 2 Employer's Requirements

March 2021

Employer:	Department of Transportation
Procuring Agent:	Procurement Service
Country:	Republic of the Philippines
Project:	The Malolos–Clark Railway Project and the North South Railway Project-South Line (Commuter)
JICA Loan No.:	PH-P270

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BIDDING DOCUMENTS

SUMMARY OF DOCUMENTS

Invitation for Bids

Volume I. Part 1 - Bidding Procedures

- Section I. Instructions to Bidders (ITB)
- Section II. Bid Data Sheet (BDS)
- Section III. Evaluation and Qualification Criteria (EQC)
- Section IV. Bidding Forms (BF)
- Section V. Eligible Source Countries of Japanese ODA Loan (ESC)

Volume II. Part 2 – Employer's Requirements

Section VI. Employer's Requirements (ER)

- a) Scope of Works (SOW)**
- b) General Requirements (ERG)**
- c) Technical Requirements (ERT)**

Volume III. Part 2 – Employer's Requirements

- Section VI. Employer's Requirements (ER)
- d) Employer's Drawings (ERD)

Volume IV. Part 3 - Conditions of Contract and Contract Forms

- Section VII. General Conditions (GC)
- Section VIII. Particular Conditions (PC)
- Section IX. Annexes to Particular Conditions-Contract Forms (CF)

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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

3.10	Additional Land for Construction Purposes, Detours, Plant and Other Uses	ERG-9
4.	Project Management by the Contractor	ERG-10
4.1	Contractor's Management Plans	ERG-10
4.2	Project Management Plan	ERG-10
4.3	Interface Management Plan	ERG-11
4.4	Works Program	ERG-13
4.5	Quality Assurance Management Plan	ERG-16
4.6	System Assurance Management Plan	ERG-18
4.7	Site Safety Management Plan	ERG-19
4.8	Software Quality Assurance Management Plan	ERG-24
4.9	Risk Management Plan	ERG-24
4.10	COVID-19 Risk Management Plan	ERG-27
4.11	Environmental Management Plan	ERG-27
4.12	Inspection, Testing and Commissioning Management Plan	ERG-34
4.13	Earthing and Bonding Strategy Plan	ERG-34
4.14	Review Periods for Contractor's Submissions	ERG-34
4.15	Failure to Make Submission	ERG-35
4.16	Plans and Program Revision	ERG-35
4.17	Planning and Programming Staff	ERG-35
4.18	Project Calendar	ERG-35
4.19	Progress Reporting	ERG-35
4.20	Co-ordination and Interface with Interface Contractors and Others	ERG-35
4.21	Spare Parts Management Plan	ERG-37
5.	Works Train Operations	ERG-38
5.1	Requirements during the Construction	ERG-38
6.	Design Submission Requirements	ERG-39
6.1	General	ERG-39
6.2	Review of Data	ERG-39
6.3	Format of Deliverables	ERG-40
6.4	Number of Copies	ERG-41
6.5	Design Submission Program	ERG-41
6.6	Design Process	ERG-41
6.7	Preliminary Design	ERG-42
6.8	Pre-Final Design	ERG-42
6.9	Final Design	ERG-42
6.10	Design Submission and Review Procedure	ERG-42
6.11	Engineer's Review	ERG-43
6.12	Final Design Document Delivery	ERG-44
6.13	As-Built Drawings and Records	ERG-44
6.14	Post Acceptance Changes	ERG-45
6.15	Approval of Manufacturers and Suppliers	ERG-45

6.16	Material Control Schedule	ERG-45
6.17	Method Statements	ERG-46
7.	Document and Drawing Submittals and Review	ERG-46
7.1	General	ERG-46
7.2	Project Document Control Procedure	ERG-47
7.3	Document Submissions	ERG-47
7.4	Submission and Response Procedure	ERG-47
7.4.1	General	ERG-47
7.4.2	Proposal	ERG-47
7.4.3	Submission Response Request	ERG-47
7.4.4	Reports and Records	ERG-48
8.	Manuals and Documents	ERG-48
8.1	Manuals and Documents for Equipment and Systems	ERG-48
8.2	Operation Manuals	ERG-49
8.3	Maintenance Manuals	ERG-49
8.4	Electronic Manuals	ERG-50
8.5	Operating/User Manuals and Maintenance and Servicing Manuals	ERG-50
8.6	Submission of Manuals and Documents	ERG-51
8.7	Number of Submission Copies	ERG-51
9.	Manpower and Workforce	ERG-51
9.1	Local and Overseas Filipino Worker (OFW)	ERG-51
9.2	Engagement of Staff and Labor	ERG-51
10.	Inspection, Testing, and Commissioning	ERG-51
10.1	General	ERG-51
10.2	Non-Conformity and Deviation Disposition	ERG-54
10.3	Engineer's Stop Work Order (SWO)	ERG-55
10.4	Engineer's Corrective Action Request (CAR)	ERG-55
10.5	Test Groups	ERG-55
11.	Defects Liability	ERG-56
11.1	Remedying Defects	ERG-56
11.2	Defects Notification Period	ERG-57
12.	Software Management and Control	ERG-58
12.1	Prescriptive Framework	ERG-58
12.2	Software Framework	ERG-59
12.3	Software Management Control	ERG-59
12.4	Auditing	ERG-59
12.5	Software Acceptance	ERG-59
12.6	Availability of Source Code and Development Tools	ERG-60
12.7	Re-Use of Existing Software	ERG-60
12.8	Test Software	ERG-60
12.9	Software Rights	ERG-61
13.	Supply of Spare Parts, Special Tools, and Test Equipment	ERG-61
13.1	Details of supply	ERG-61

	13.2	Manufacture and delivery of Spare Parts	ERG-62
	13.3	Testing and Commissioning Spares	ERG-63
	13.4	O&M Spares	ERG-63
	13.5	Special Tools and Test Equipment	ERG-64
	13.6	Coding and Tagging of all Equipment, Spare Parts and Special Tools and Test Equipment	ERG-65
14.		Packaging, Shipping, and Delivery	ERG-65
	14.1	General	ERG-65
	14.2	Crating	ERG-66
	14.3	General Precautions	ERG-66
	14.4	Packing Procedures	ERG-67
	14.5	Shipping	ERG-67
	14.6	Delivery	ERG-68
15.		Training	ERG-68
	15.1	General	ERG-68
	15.2	Training Requirements	ERG-68
	15.3	Training Periods	ERG-69
	15.4	Language of Training Courses	ERG-69
	15.5	Training Instructors	ERG-69
	15.6	Contractor’s obligation to obtain Approval of Instructors	ERG-69
	15.7	Employer’s Railway Operations Staff	ERG-69
	15.8	Training Program	ERG-69
	15.9	Training Courses	ERG-70
	15.10	All Necessary Railway Operational Instruction Aids and Materials	ERG-70
	15.11	Plant and materials set aside for Training Purposes	ERG-70
	15.12	Protective Clothing-Training	ERG-70
	15.13	Monitoring	ERG-70
	15.14	Training Practical Tests and Aptitude Reports	ERG-70
	15.15	Monitoring of Training Progress	ERG-70
	15.16	Records of Training Progress to be Maintained	ERG-71
	15.17	Issue Test Results and progress to the Engineer	ERG-71
	15.18	Training Location and Facilities	ERG-71
	15.19	Occupational Health and Safety of Trainees	ERG-71
	15.20	Administration	ERG-71
16.		Site Office and Site Office Management	ERG-72
	16.1	Site Restrictions	ERG-72
	16.2	Site Office Facilities	ERG-72
	16.3	Site Management	ERG-73
	16.4	Services	ERG-74
	16.5	Accommodation	ERG-74
17.		Road Traffic and Transportation	ERG-75
	17.1	General	ERG-75
	17.2	Transportation to Site	ERG-75
18.		Meeting Requirements	ERG-76

18.1	General	ERG-76
18.2	Monthly Progress Meetings	ERG-77
18.3	Programme Analysis Report	ERG-78
19.	Liaison with Others	ERG-79
19.1	Approvals from Government Authorities and Agencies	ERG-79
19.2	Meetings with the Engineer	ERG-79
19.3	Meetings with the O&M Concessionaire	ERG-79
19.4	Meetings with Government Departments and Agencies	ERG-79
19.5	Correspondence with Government Departments and Agencies	ERG-79
20.	Interface Management	ERG-79
20.1	General	ERG-79
20.2	Exchange of Information with Interfacing Contractors	ERG-80
20.3	Request for Information	ERG-81
20.4	Interface and Co-ordination with Interfacing Contractors	ERG-81
20.5	Meetings with Interfacing Contractors	ERG-82
20.6	Issuance of Information Related to Interfaces and Coordination	ERG-82
20.7	Liability for Failed Interfaces	ERG-82
20.8	Design Co-ordination with Interface Contractors	ERG-82
20.9	Construction Interfaces and Co-ordination	ERG-83
20.10	Interface Management Plan	ERG-83
21.	System Assurance	ERG-85
21.1	General	ERG-85
21.2	System Safety Assurance Management	ERG-87
21.3	Reliability, Availability, and Maintainability Management	ERG-89
21.4	Electromagnetic Compatibility (EMC) Management	ERG-94
21.5	Engineering Change Management	ERG-95
22.	Requirements Management	ERG-96
23.	Asset Management	ERG-97
24.	Demobilization and Closing Works	ERG-98
24.1	Demobilization	ERG-98
24.2	Closing Works	ERG-99
24.3	Training Completion	ERG-100
25.	Security and Insurance	ERG-100
25.1	Security	ERG-100
25.2	Insurance	ERG-100
26	Publicity and Public Relations	ERG-100
26.1	General	ERG-100
26.2	Public Relations Plan	ERG-101
26.3	Public Consultation	ERG-102
26.4	Public Relations Tools	ERG-102
26.5	Co-ordination with Other Contractors	ERG-103
	Appendix 1: General Abbreviations	ERG-105
	Appendix 2: Program	ERG-108
	Appendix 3: Monthly Progress Report	ERG-123

Appendix 4: Submittals Required	ERG-125
Appendix 5: Quality Assurance Requirements	ERG-127
Appendix 6: Engineering Safety Management Plan	ERG-132
Appendix 7: Outline Interface Matrices	ERG-133
Appendix 8: Outline Interface Demarcation with MMSP and NSCR	ERG-180

c) Technical Requirements (ERT)

1. Track Works

1.1	Scope of Works	ERT-1
1.2	Definitions and Abbreviations	ERT-2
1.3	List of Acronyms and Abbreviations	ERT-3
1.4	Design Requirements	ERT-5
1.5	Particular Track Specifications	ERT-9
1.6	Operational Criteria	ERT-13
1.7	Component Design List	ERT-14
1.8	Track Work Construction	ERT-15
1.9	Procedures	ERT-16
1.10	Installation	ERT-18
1.11	Construction Tolerances	ERT-20
1.12	Rail	ERT-22
1.13	Rail Fastening System	ERT-26
1.14	Prestressed Concrete Sleepers	ERT-32
1.15	Track Ballast	ERT-33
1.16	Rail Expansion Joints	ERT-34
1.17	Turnout	ERT-35
1.18	Rail Welding	ERT-40
1.19	Buffer Stops	ERT-45
1.20	Insulated Rail Joint Glued Type	ERT-46
1.21	Staff Walkway in Depot	ERT-47
1.22	Stray Current Corrosion Control	ERT-47
1.23	Walkway	ERT-47
1.24	Access Platform and Stairs	ERT-50
1.25	Depot Line and Load Gauge	ERT-50
1.26	Miscellaneous Track Work Items	ERT-51
1.27	Track Maintenance Vehicles and Equipment	ERT-51
1.28	Interfacing Requirements	ERT-63
1.29	Maintenance, Manual and Knowledge Transfer	ERT-64
1.30	Testing, Commissioning and Verification	ERT-66
1.31	Packing, Shipping, Storage and Delivery	ERT-70

2. Signaling System

2.1	Introduction	ERT-72
2.2	Definitions and Abbreviations	ERT-72
2.3	List of Standards	ERT-80
2.4	Scope of Work	ERT-83

2.5	General Requirements	ERT-85
2.6	Scope of Supply	ERT-85
2.7	Services	ERT-88
2.8	Performance Requirements	ERT-89
2.9	Electromagnetic Compatibility	ERT-95
2.10	Functional Requirements	ERT-100
2.11	Operating Criteria	ERT-102
2.12	System Architecture	ERT-106
2.13	Emergency Stop Switches	ERT-114
2.14	ATP Functional Requirements	ERT-115
2.15	ATP On-board equipment	ERT-116
2.16	Computer Based Interlocking	ERT-118
2.17	Automatic Train Supervision (ATS)	ERT-124
2.18	Operations Control Center (OCC)	ERT-145
2.19	Depot	ERT-149
2.20	Wayside Equipment	ERT-151
2.21	Environmental	ERT-154
2.22	Power Supply Requirements	ERT-155
2.23	Design Requirements	ERT-157
2.24	System Safety Design Requirements	ERT-159
2.25	Quality Assurance	ERT-161
2.26	Interfaces	ERT-161
2.27	Installation	ERT-166
2.28	Cables	ERT-168
2.29	Identification	ERT-171
2.30	Drawings and Records	ERT-172
2.31	Earthing and Transient Protection	ERT-172
2.32	Transient and Lightning Protection	ERT-173
2.33	Verification, Testing and Commissioning	ERT-174
2.34	Reporting	ERT-184
2.35	Operation and Maintenance Support	ERT-185
2.36	Spare Parts, Special Tools and Test Equipment	ERT-186
2.37	Training	ERT-186
2.38	Appendix A1: Signaling/Rolling Stock Interfaces	ERT-187
2.39	Appendix A2 –Station and Depot Civil and E&M, Contractors Interfaces	ERT-199
2.40	Appendix A3 – Train Control/Communication Contractors Interfaces	ERT-199
2.41	Appendix A4 – Train Control/Track Contractor Interfaces	ERT-202
2.42	Appendix A5 – Train Control/Power Supply (including Traction, Substation, Power Distribution & OCS) Interfaces	ERT-206
2.43	EMC Management Plan	ERT-207
3.	Telecommunications	
3.1	Introduction	ERT-208

3.2	Scope of Work	ERT-208
3.3	Definitions and Abbreviations	ERT-211
3.4	Design Standards	ERT-222
3.5	General Design Requirements	ERT-226
3.6	System Requirements	ERT-228
3.7	Performance Requirements (General)	ERT 233
3.8	Packing, Shipping and Delivery	ERT-234
3.9	Testing, Commissioning & Verification	ERT-234
3.10	Consumable and Spare Parts	ERT-240
3.11	Interface Requirements	ERT-241
	Appendix 1: Backbone Transmission System (BTS)	ERT-251
	Appendix 2: Radio System	ERT-261
	Appendix 3: Voice and Data Systems	ERT-312
	Appendix 4: Closed Circuit Television (CCTV) System	ERT-318
	Appendix 5: Passenger Information Display System (PIDS)	ERT-331
	Appendix 6: Public Address (PA) System	ERT-335
	Appendix 7: Time Server and Master Clock System	ERT-343
	Appendix 8: Meteorological and Seismic Monitoring System	ERT-348
	Appendix 9: Power Supply for Telecommunication System (UPS)	ERT-351
	Appendix 10: Flight Information Display System (FIDS)	ERT-357
4.	Power Supply System	
I.	The Malolos-Clark Railway Project (MCRP)	
4.1	Scope of Work	ERT-360
4.2	Definitions and Abbreviations	ERT-369
4.3	Design Criteria and Standards	ERT-372
4.4	Technical Requirements	ERT-375
4.5	Installation requirement	ERT-396
4.6	Interfacing Requirements	ERT-399
4.7	Testing, Commissioning and Verification	ERT-401
4.8	Measuring and Special Tools	ERT-406
4.9	Training Requirements	ERT-406
4.10	Maintenance Requirements	ERT-408
II.	The North South Railway Project-South line (Commuter) (NSRP-South)	ERT-410
4.1	Scope of Work	ERT-410
4.2	Definitions and Abbreviations	ERT-418
4.3	Design Criteria and Standards	ERT-421
4.4	Technical Requirements	ERT-424
4.5	Installation requirement	ERT-446
4.6	Interfacing Requirements	ERT-448
4.7	Testing, Commissioning and Verification	ERT-450
4.8	Measuring and Special Tools	ERT-455
4.9	Training Requirements	ERT-455
4.10	Maintenance Requirements	ERT-458

5.	Power Distribution System	
I.	The Malolos-Clark Railway Project (MCRP)	ERT-459
5.1	Scope of Works	ERT-459
5.2	Definitions and Abbreviations	ERT-468
5.3	Design Criteria, Applicable Standards and Codes	ERT-470
5.4	Performance Requirements	ERT-471
5.5	Operational Requirements	ERT-472
5.6	Functional Requirements	ERT-472
5.7	Installation Requirements	ERT-484
5.8	Interfacing Requirements	ERT-486
5.9	Testing, Commissioning and Verification	ERT-486
5.10	Measuring and Special Tools	ERT-491
5.11	Training Requirements	ERT-492
5.12	Maintenance Requirements	ERT-494
II.	The North South Railway Project-South line (Commuter) (NSRP-South)	ERT-497
5.1	Scope of Works	ERT-497
5.2	Definitions and Abbreviations	ERT-508
5.3	Design Criteria, Applicable Standards and Codes	ERT-510
5.4	Performance Requirements	ERT-511
5.5	Operational Requirements	ERT-512
5.6	Functional Requirements	ERT-512
5.7	Installation Requirements	ERT-524
5.8	Interfacing Requirements	ERT-526
5.9	Testing, Commissioning and Verification	ERT-526
5.10	Measuring and Special Tools	ERT-531
5.11	Training Requirements	ERT-532
5.12	Maintenance Requirements	ERT-534
6.	Overhead Contact Line System	
6.1	Scope of Works	ERT-537
6.2	Fundamental Design Data	ERT-559
6.3	System Requirements	ERT-565
6.4	Standard Equipment Requirements	ERT-576
6.5	Testing, Inspection and Commissioning	ERT-611
6.6	Documentation	ERT-612
6.7	Quality Assurance and Control	ERT-613
6.8	Overhead Line Inspection Vehicle	ERT-613
6.9	Special Tools	ERT-616
6.10	Training Program	ERT-617
7.	Automatic Fare Collection (AFC)	
7.1	Scope of Works	ERT-619
7.2	Limited Express Ticket System	ERT-619
7.3	Definitions and Abbreviations	ERT-620
7.4	Scope of Equipment Supply	ERT-623

7.5	Equipment Environmental Conditions	ERT-625
7.6	Documentation	ERT-626
7.7	System Operational Requirements	ERT-627
7.8	System Requirements	ERT-641
7.9	Equipment, Design and Material Requirements	ERT-648
7.10	Interfaces	ERT-665
7.11	Packing, Shipping, Storage and Delivery	ERT-667
7.12	Testing, Commissioning and Verification	ERT-668
7.13	Installation	ERT-670
7.14	Training	ERT-673
7.15	Maintenance	ERT-674
7.16	Measuring and Special Tools	ERT-675
8.	Depot Facilities	
8.1	Scope of Works	ERT-676
8.2	Definitions and Abbreviations	ERT-682
8.3	Design Criteria, Applicable Standards and Codes	ERT-683
8.4	Engineering Conditions	ERT-685
8.5	Design Parameters	ERT-686
8.6	Performance and Technical Requirements	ERT-686
8.7	Maintenance Management	ERT-688
8.8	Depot/Workshop Capacity	ERT-689
8.9	Depot/Workshop Maintenance Facilities	ERT-701
8.10	Depot/Workshop Layout	ERT-713
8.11	Interface Coordination	ERT-718
8.12	Testing, Commissioning and Verification	ERT-719
8.13	Training	ERT-719
8.14	Drawings	ERT-720
	Appendix 8-1	ERT-721
Part A	North Depot	ERT-721
	N01 Light Repair Shop	ERT-722
	N01.01 Cleaning Set	ERT-722
	N01.02 Air Blow Booth with Dust Collector	ERT-723
	N01.03 Insulation Resistance Tester	ERT-724
	N01.04 Battery Charger	ERT-725
	N01.05 Filter Washing Machine	ERT-726
	N01.06 Double Head Grinder	ERT-727
	N01.07 Upright Drilling Machine	ERT-728
	N01.08 Disc Cutter	ERT-729
	N01.09 Welding Machine	ERT-730
	N01.10 Oxygen Acetylene Gas Welder	ERT-731
	N01.11 Air Compressor (Include Air tank)	ERT-732
	N01.12 Forklift Truck 2t	ERT-733
	N01.13 Worktable	ERT-734
	N01.14 Tool Cabinet	ERT-736

N01.15 Rack System	ERT-736
N01.16 High-Pressure Water Cleaner	ERT-737
N01.17 Sewage Discharge Pipe	ERT-738
N01.18 Front Car Maintenance Platform	ERT-739
N02 UN-Scheduled Repair Shop	ERT-740
N02.01 10/3t Overhead Travelling Crane	ERT-740
N02.02 Bogie Replacing Equipment	ERT-741
N02.03 Underfloor Equipment Exchange Device 2t	ERT-743
N02.04 Movable Lifting Platform	ERT-744
N02.05 Boarding Step	ERT-745
N02.06 Welding Machine	ERT-746
N02.07 Oxygen Acetylene Gas Welder	ERT-747
N02.08 Work Table	ERT-748
N02.09 Tool Cabinet	ERT-749
N02.10 Front Car Working Deck	ERT-740
N03 Under Floor Wheel Re-Profiling Lathe	ERT-751
N03.01 Under Floor Wheel Re-Profiling Lathe	ERT-751
N03.02 Jib Crane 1t	ERT-754
N03.03 Worktable	ERT-755
N03.04 Tool Cabinet	ERT-756
N03.05 Baby Compressor	ERT-757
N04 Carbody Washer	ERT-758
N04.01 Automatic Car Body Washer	ERT-758
N11 Underfloor Cleaning Shop	ERT-761
N11.01 Underfloor Air Blow Machine with Dust Collector	ERT-761
N12 Bogie Removal / Installation Shop	ERT-762
N12.01 10/3 t Overhead Traveling Crane	ERT-762
N12.02 Car Body Lifting Jack	ERT-763
N12.03 Not Used	ERT-765
N12.04 Temporary Bogie	ERT-766
N12.05 Welding Machine	ERT-767
N12.06 Oxygen Acetylene Gas Welder	ERT-768
N12.07 Work Table	ERT-769
N12.08 Tool Cabinet	ERT-770
N12.09 Bogie Transport Equipment	ERT-771
N13 Carbody Shop	ERT-772
N13.01 3t Overhead Traveling Crane	ERT-772
N13.02 Not Used	ERT-773
N13.03 Underfloor Equipment Lifter 2t	ERT-774
N13.04 Movable Lifting Platform	ERT-775
N13.05 Boarding Step	ERT-776
N13.06 Tight lock Coupler Carrier	ERT-777
N13.07 Double Head Grinder	ERT-779

N13.08 Upright Drilling Machine	ERT-780
N13.09 Disc Cutter	ERT-781
N13.10 Welding Machine	ERT-782
N13.11 Oxygen Acetylene Gas Welder	ERT-783
N13.12 Work Table	ERT-784
N13.13 Tool Cabinet	ERT-785
N14 Sewage Tank Shop	ERT-786
N14.01 3t Overhead Traveling Crane	ERT-786
N14.02 High-Pressure Water Cleaner	ERT-787
N14.03 Work Table	ERT-788
N14.04 Tool Cabinet	ERT-789
N15 Paint Shop	ERT-790
N15.01 Work Lift Platform	ERT-791
N15.02 Car Body Washing Booth	ERT-791
N15.03 Car Body Painting Booth	ERT-792
N15.04 Car Body Drying Booth	ERT-793
N15.05 Airless Spray-painting Machine	ERT-795
N15.06 Parts Painting Booth	ERT-796
N15.07 Traverser	ERT-797
N16 Traction Motor Shop	ERT-799
N16.01 3t Overhead Traveling Crane	ERT-799
N16.02 Air Blow Booth with Dust Collector	ERT-800
N16.03 Insulation Resistance Tester	ERT-801
N16.04 Grease Supply Equipment	ERT-802
N16.05 Induction Heater for flexible coupling	ERT-803
N16.06 Motor No-load Test Equipment	ERT-804
N16.07 Rack System	ERT-805
N16.08 Work Table	ERT-806
N16.09 Tool Cabinet	ERT-807
N17 Bogie Shop	ERT-808
N17.01 10 /3t Overhead Traveling Crane	ERT-808
N17.02 5t Overhead Traveling Crane	ERT-809
N17.03 Bogie Turntable	ERT-810
N17.04 Wheelset Turntable	ERT-811
N17.05 Bogie Disassembling/Assembling	ERT-812
N17.06 Bogie Washing Machine	ERT-813
N17.07 Bogie Frame Stand Set	ERT-815
N17.08 Magnetic Flaw Detector (Movable)	ERT-816
N17.09 Bogie Painting/Drying Booth,	ERT-818
N17.10 Double Head Grinder	ERT-820
N17.11 Upright Drilling Machine	ERT-821
N17.12 Welding Machine	ERT-822
N17.13 Oxygen Acetylene Gas Welder	ERT-823
N17.14 Work Table	ERT-824

N17.15 Tool Cabinet	ERT-825
N17.16 3t Overhead Traveling Crane	ERT-826
N17.17 Bogie Test Stand	ERT-827
N18 Air Conditioner Shop	ERT-828
N18.01 3t Overhead Traveling Crane	ERT-828
N18.02 High-Pressure Water Cleaner	ERT-829
N18.03 Air Conditioner Parts Washing Bath	ERT-830
N18.04 Air Conditioner Testing System	ERT-831
N18.05 Copper Pipe Cutting Welding Equipment	ERT-832
N18.06 Cooler Carrier	ERT-833
N18.07 Work Table	ERT-834
N18.08 Tool Cabinet	ERT-835
N18.09 Pump Down Equipment w/ Recovery Tank	ERT-836
N18.10 Refrigerant Charging Equipment	ERT-837
N18.11 Gas Leak Detector	ERT-838
N19 Electric Parts Shop	ERT-839
N19.01 Air Blow Booth with Dust Collector	ERT-839
N19.02 Parts Washer	ERT-840
N19.03 Insulation Resistance Tester	ERT-841
N19.04 Test electric Power Supply	ERT-842
N19.05 Induction Heater	ERT-843
N19.06 Air Compressor Testing Equipment	ERT-844
N19.07 Pantograph Testing Equipment	ERT-845
N19.08 Battery Charger	ERT-846
N19.09 Soft Blast Equipment	ERT-847
N19.10 Double Head Grinder	ERT-848
N19.11 Upright Drilling Machine	ERT-849
N19.12 Work Table	ERT-850
N19.13 Tool Cabinet	ERT-851
N19.14 3t Overhead Traveling Crane	ERT-852
N20 Wheelset Shop	ERT-853
N20.01 3t Overhead Traveling Crane	ERT-853
N20.02 Wheelset Turntable	ERT-854
N20.03 Axle Bearing Pulling/Fitting Press	ERT-855
N20.04 Wheelset Washing Machine	ERT-856
N20.05 Axle Grinding Machine	ERT-858
N20.06 Axle Magnetic Flaw Detector	ERT-860
N20.07 Axle Ultrasonic Flaw Detector	ERT-862
N20.08 Surface Wheel Lathe	ERT-864
N20.09 Oil Flushing Equipment	ERT-866
N20.10 Axle Lathe	ERT-868
N20.11 Wheel Boring Machine	ERT-869
N20.12 Wheel Fitting Press	ERT-871
N20.13 Work Table	ERT-873

N20.14 Tool Cabinet	ERT-869
N21 Bearing Shop	ERT-875
N21.01 Bearing Washer	ERT-875
N21.02 Oil seal draw-out equipment	ERT-876
N21.03 Oil seal fit & grease supply equipment	ERT-877
N21.04 Work Table	ERT-879
N21.05 Tool Cabinet	ERT-880
N22 Spring, Air Spring, Brake Parts & Iron Workshop	ERT-881
N22.01 3t Overhead Traveling Crane	ERT-881
N22.02 Shot Blast Machine	ERT-882
N22.03 Magnetic Flaw Detector	ERT-883
N22.04 Coil Spring Tester	ERT-885
N22.05 Hydraulic Press 30t	ERT-886
N22.06 Air Spring Leakage Tester	ERT-887
N22.07 Oil Damper Tester	ERT-888
N22.08 Double Head Grinder	ERT-890
N22.09 Upright Drilling Machine	ERT-891
N22.10 Welding Machine	ERT-892
N22.11 Oxygen Acetylene Gas Welder	ERT-893
N22.12 Work Table	ERT-894
N22.13 Tool Cabinet	ERT-895
N23 Tight Lock Coupler and Draft Gear Shop	ERT-896
N23.01 3t Overhead Traveling Crane	ERT-896
N23.02 Parts Washer	ERT-897
N23.03 Magnetic Flaw Detector	ERT-899
N23.04 Hydraulic Press 50t	ERT-900
N23.05 Draft Gear Setter	ERT-901
N23.06 Double Head Grinder	ERT-902
N23.07 Upright Drilling Machine	ERT-903
N23.08 Welding Machine	ERT-904
N23.09 Oxygen Acetylene Gas Welder	ERT-905
N23.10 Work Table	ERT-906
N23.11 Tool Cabinet	ERT-907
N24 Seat Shop	ERT-908
N24.01 3t Overhead Traveling Crane	ERT-908
N24.02 Seat Cleaning Machine	ERT-909
N24.03 Vacuum Cleaner	ERT-910
N24.04 Work Table	ERT-911
N24.05 Tool Cabinet	ERT-912
N25 Air Brake Valve Shop	ERT-913
N25.01 Parts Washer	ERT-913
N25.02 Ultrasonic Parts Cleaner	ERT-914
N25.03 Air Blow Booth with Dust Collector	ERT-915
N25.04 Pressure Gauge Tester	ERT-916

N25.05 Hydraulic Press 30t	ERT-917
N25.06 Work Table	ERT-918
N25.07 Tool Cabinet	ERT-919
N26 Mechanical Shop	ERT-920
N26.01 3t Overhead Traveling Crane	ERT-920
N26.02 Lathe	ERT-921
N26.03 Pipe Threading Machine	ERT-922
N26.04 Universal Milling Machine	ERT-923
N26.05 Double Head Grinder	ERT-924
N26.06 Upright Drilling Machine	ERT-925
N26.07 Radial Drilling Machine	ERT-926
N26.08 Metal Cutting Machine	ERT-927
N26.09 Work Table	ERT-928
N26.10 Tool Cabinet	ERT-929
N27 Warehouse	ERT-930
N27.01 Rack System	ERT-930
N27.02 Wheelset Storage System	ERT-931
N27.03 Traction Motor storage System	ERT-932
N28 Compressor Room	ERT-933
N28.01 Air Compressor (Include Air Tank)	ERT-933
N29 Not Used	ERT-934
N30 Weatherproof Test Shop	ERT-935
N30.01 Weatherproof Testing Equipment	ERT-935
N31 Final Adjustment Shop	ERT-936
N31.01 Insulation Resistance Tester	ERT-936
N31.02 Wheel Load Measuring System	ERT-937
N31.03 Testing Electric Power Supply	ERT-938
N31.04 Tool Cabinet	ERT-939
N41 Shunting Car Shop	ERT-940
N41.01 Shunting Locomotive	ERT-940
N41.02 Shunting Locomotive (Engine Type)	ERT-941
N41.03 Fuel Supply Equipment (Include Fuel Tank)	ERT-943
N51 Not Used	ERT-945
N61 Common Use	ERT-946
N61.01 5-ton Forklift Truck	ERT-946
N61.02 3-ton Forklift Truck	ERT-947
N61.03 5-ton Cargo Truck	ERT-948
N61.04 Rescue device	ERT-949
N61.05 Vehicle (Van)	ERT-951
N71 Tools	ERT-952
N71.01 Measuring Instruments, Gauges	ERT-952
N72.02 General Tools	ERT-953
Part B South Depot	ERT-956

S01 Light Repair Shop	ERT-956
S01.01 Cleaning Set	ERT-956
S01.02 Air Blow Booth with Dust Collector	ERT-957
S01.03 Insulation Resistance Tester	ERT-958
S01.04 Battery Charger	ERT-959
S01.05 Filter Washing Machine	ERT-960
S01.06 Double Head Grinder	ERT-961
S01.07 Upright Drilling Machine	ERT-962
S01.08 Disc Cutter	ERT-963
S01.09 Welding Machine	ERT-964
S01.10 Oxygen Acetylene Gas Welder	ERT-965
S01.11 Air Compressor (Include Air tank)	ERT-966
S01.12 Forklift Truck 2t	ERT-967
S01.13 Work Table	ERT-968
S01.14 Tool Cabinet	ERT-969
S01.15 Rack System	ERT-970
S01.16 High-Pressure Water Cleaner	ERT-971
S02 Un-Scheduled Repair Shop	ERT-972
S02.01 10/3t Overhead Travelling Crane	ERT-972
S02.02 Bogie Replacing Equipment	ERT-973
S02.03 Underfloor Equipment Exchange Device 2t	ERT-975
S02.04 Movable Lifting Platform	ERT-976
S02.05 Boarding Step	ERT-977
S02.06 Welding Machine	ERT-978
S02.07 Oxygen Acetylene Gas Welder	ERT-979
S02.08 Work Table	ERT-980
S02.09 Tool Cabinet	ERT-981
S02.10 Bogie Transport Equipment	ERT-982
S02.11 Car Body Lifting Jack	ERT-983
S03 Wheel Re-Profiling Shop	ERT-985
S03.01 Underfloor Wheel Re-profiling Lathe	ERT-985
S03.02 Jib Crane 1t	ERT-988
S03.03 Work Table	ERT-989
S03.04 Tool Cabinet	ERT-990
S03.05 Baby Compressor	ERT-991
S04 Carbody Washer	ERT-992
S04.1 Automatic Car Body Washer	ERT-992
S41 Shunting Car Shop	ERT-995
S41.01 Shunting Locomotive (Both Rail and Road Drive Type)	ERT-995
S51 Not Used	ERT-996
S51.01 Not Used	ERT-996
S61 Common Use	ERT-997
S61.01 Not Used	ERT-997

	S61.02 Not Used	ERT-998
	S61.03 Not Used	ERT-999
	S61.04 5-ton Cargo Truck	ERT-1000
	S61.05 Rescue device	ERT-1001
	S61.06 Vehicle (Van)	ERT-1003
	S71 Tools	ERT-1004
	S71.01 Measuring Instruments, Gauges	ERT-1004
	S71.02 General Tools	ERT-1005
9.	Training Facility at Training Center	ERT-1007
9.1	General	ERT-1007
9.2	Requirements	ERT-1007
10.	Platform Screen Doors	ERT-1018
10.1	Scope of Work	ERT-1018
10.2	Design Criteria and Standard	ERT-1023
10.3	Design Requirements	ERT-1024
10.4	Control and Monitoring	ERT-1031
10.5	Structural Integrity and Durability	ERT-1033
10.6	Architectural Requirements	ERT-1034
10.7	Testing, Commissioning, and Verification	ERT-1036
10.8	Operation and Maintenance Support	ERT-1040
10.9	Interfacing Requirements with Civil	ERT-1042
11.	Computerized Maintenance Management System	ERT-1050
11.1	Scope of Work	ERT-1050
11.2	Abbreviations	ERT-1053
11.3	Design Criteria, Applicable Standards, and Codes	ERT-1054
11.4	System Description and Performance Requirements	ERT-1055
11.5	Interface Requirements	ERT-1064
11.6	DRACAS Database	ERT-1066
12.	Integrated Operations Control Center and Depot Control Center	ERT-1070
12.1	Introduction	ERT-1070
12.2	Scope of Works	ERT-1070
12.3	Design Requirements	ERT-1071
12.4	Control Center Layout	ERT-1073
12.5	Workstation General Functionality	ERT-1074
12.6	Control Room Design, Materials Finishes and Facilities	ERT-1074

SECTION VI - EMPLOYER'S REQUIREMENTS

a) SCOPE OF WORKS (SOW)

Employer's Requirements

a) Scope of Works (SOW)

1. General

The purpose of this document is to provide the Scope of Works (SOW) for the Contractor for the E&M Systems and Track Works. A detailed description of the SOW is provided in Part 2- Employer's Requirements – Section VI – Employer's Requirements, which are subdivided into General Requirements (ERG) and Technical Requirements (ERT).

The SOW consists of both Malolos Clark Railway Project, hereinafter shown as 'MCRP' and North South Railway Project - South Line (Commuter), hereinafter shown as 'NSRP-South', connecting with North South Commuter Railway, hereinafter shown as 'NSCR' with mutual through train operation. The MCRP commences at Clark International Airport and connects to the NSCR at Malolos. The NSRP-South connects with the NSCR at 200m south of Solis Station and continues to Calamba with a connection to the Metro Manila Subway Project hereinafter shown as "MMSP" at Bicutan. The NSRP-South also includes the spurs from Blumentritt and Solis stations to Tutuban Station. At the connections with NSCR and MMSP, the E&M systems and track work shall be fully integrated to ensure full seamless interoperability between the various rail services. Depots will be located in Mababacat on the MCRP and at Banlic on NSRP-South. The mainline runs predominantly on viaducts with the Clark International Airport and the approach tracks being in tunnels.

It should be noted that the power supply and distribution systems as well as the overhead contact line system shall be sized based on the ultimate rolling stock fleet and timetable. The sizes of the equipment, cables, and conductors, etc. stated within the ERT are for indication only and shall be supplied to suit the actual operational requirements established by detailed simulations. The power supply systems shall be designed for maximum power efficiency and economy.

2. Scope of Contract

The Contract shall include the design, supply, manufacture, delivery, integration of systems, installation, testing, and commissioning of all equipment and systems required for the efficient operation and maintenance of this project all in compliance with the outline design described in the Employer's Requirements and Drawings.

This Contract includes the following parts:

- a) Track Works for the mainline and depots.
- b) Signaling System for the mainline and depots.
- c) Telecommunications for the mainline and depots.
- d) Power Supply system at the substations.
- e) Power Distribution System at the stations, between stations and depots.
- f) Overhead Contact line System for the mainline and depots.
- g) Automatic Fare Collection System
- h) Depot & Workshop Facility at the depots.
- i) Training Facility at training center
- j) Platform Screen Doors at stations
- k) Computerized Maintenance Management System
- l) Integrated Operations Control Center.

The Employer will not provide any equipment or free issue materials to the Contractor. The Contractor shall be responsible for the provision of all equipment and materials that is required for his construction activities and the tests.

3. Outline of Track Works

The outline of track works is as follows:

- a) Track works for MCRP and NSRP-South consist of mainline tracks, approach lines to the depot, and depot tracks.
 - b) For the viaduct sections of the mainline continuous welded rail is used. The precast sleeper with elastic fastenings is to be directly fastened on the concrete trackbed with shear connectors provided by civil contractors.
 - c) For the embankment sections of the mainline, the same elastic pre-cast sleepers are to be directly fastened on the concrete trackbed. There shall be drainage slope and shear connectors provided by the civil contractors.
 - d) For the depot area, jointed rails shall be used. The pre-cast sleeper with elastic fastenings are laid on a ballast layer for the stabling tracks. The directly fastened track on the column or wall of the pit or the embedded track on the concrete floors are to be adopted for the inspection tracks, vehicle maintenance tracks, and vehicle washing tracks. Other types of tracks will be selected according to the function in the depot area.
 - e) Turnouts on the mainline shall use plastic/FFU sleepers directly fastened to the concrete track. Turnouts in the depot shall be will be installed on FFU sleepers.
 - f) The track gauge is the standard 1435mm with 60 kg/m rail for the mainline and depot approach lines and JIS50N rail for the depot areas.
 - g) A operation speed of 160km/h is to be applied on some parts of the MCRP with the remainder of the mainline having an operation speed of 120km/h.
 - h) Track mounted maintenance vehicles.
- System details are described in ERT.

4. Outline of Signaling System

The outline of the Signaling System is as follows;

- a) Signaling system is to be based on ETCS level 2 with a maximum speed of 160 km/h
 - b) Signaling System works together with Automatic Train Protection System (ATP), Train Detection System, Computer Based Interlocking System, Automatic Traffic Supervision System as a minimum and provision for Automatic Train Operation (ATO).
 - c) Onboard equipment for Commuter, Limited Express, and MMSP Rolling Stock plus maintenance vehicles.
 - d) All Cables, Cable Containment and supports for the system.
- System details are described in ERT.

5. Outline of Telecommunications

The outline of the Telecommunications is as follows;

- a) Backbone System
- b) Radio System
- c) Dispatcher Telecommunications
- d) Voice and Data Radio System
- e) CCTV System
- f) Passenger Information and Flight Information Display Systems
- g) Public Address
- h) Time Server and Master Clock System
- i) Meteorological and Seismic Monitoring System
- j) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

6. Outline of Power Supply System

The outline of the Power Supply Systems is as follows;

- a) Substations, battery posts, and sectioning posts for the mainline and in the depots.
- b) Power will be supplied from traction substation (TSS) to the train through an Overhead Contact line System (OCS) and to other facilities through a 6.6kV loop Distribution system (PDS).
- c) 69kV power shall be provided by electric utility companies (MCRP).
115kV power shall be provided by MERALCO (NSRP-South) except for TSS1 which is supplied at 34.5kV.
- d) SCADA System for TSS's, overhead contact line system, and electrical equipment.
- e) Solar Panel power generation for selected stations and depots.
- f) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

7. Outline of the Power Distribution System

The outline of the Power Distribution Systems is as follows;

- a) Distribution cable network installation on the mainline and in depots
- b) Works at station electrical rooms and high voltage electrical room in the depots
- c) Distribution of power to equipment for train operation, station equipment, etc.
- d) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

8. Outline of the Overhead Contact Line System

The outline of the Overhead Contact line Systems is as follows;

- a) Feeder-Messenger Catenary System in mainline and Simple Catenary System at Depot
Installation of a catenary system suitable for train operation speed of 160km/h on sections of the MCRP and operational speed of 120km/h for the other areas.
- b) Overhead Line Inspection Vehicles
System details are described in ERT.

9. Outline of Automatic Fare Collection System

The outline of the Automatic Fare Collection Systems is as follows;

- a) The Design, Manufacture, Delivery, Installation, System Assurance, Testing and Commissioning of the AFC system.
- b) The AFC system of MCRP and NSRP-South shall use a contactless IC card that is inter-operative with the existing LRT 1, LRT 2, MRT 3, and the new NSCR and MMSP lines.
- c) Interface works between Level 3 AFC system with the Central Clearing House System and the Card 1st Issuer to undertake the integration of common ticketing and business rules into the AFC system.
- d) The AFC system performance shall conform to the AFC National Standard and the Business Rules.
- e) The AFC system shall include the ticketing system for Limited Express trains for the airport service.
- f) The AFC system shall be robust, flexible, and capable for future extensions and interchanges.
- g) All Cables, Cable Containment and supports for the system.
System Details are described in ERT.

10. Depot Facilities

The outline of the Depot and Workshop Facilities are;

- a) Installation of equipment for Depot and Workshop shall include the following as a minimum:
 - i Equipment to support Preventive Maintenance activities;
 - ii Equipment to support Corrective Maintenance activities;
 - iii Equipment to support Major Overhaul activities;
- b) All Cables, Cable Containment and supports for the system.
Systems details are described in ERT.

11. Outline of Training Facilities at Training Center (MCRP)

The outline of Training Facilities is as follows;

- a) Train Operation Simulators
- b) Track Work
 - i Elastic Sleeper Directly Fastened Track
 - ii Ballasted Track
 - iii Simple Turnout
- c) Signaling System
 - i Equipment in OCC
 - ii Equipment in Stations
 - iii Ground equipment including radio equipment
 - iv Onboard equipment including radio equipment
- d) Telecommunications
 - i Equipment for Network System (Miniature)
 - ii Radio equipment
 - iii PID equipment
 - iv CCTV equipment
 - v PA equipment
- e) Power Supply System
 - i Equipment at Substation
- f) Overhead Contact line System
 - i Support structure
 - ii Catenary
 - iii Various equipment
 - iv Tool
- g) AFC System
 - i Automatic Gate
 - ii Ticket Vending Machine
 - iii Point of Sales equipment
 - iv Handheld Terminal
 - v Station Accounting Computer System
 - vi Central Computer System
- h) Pantograph and Bogie Assembly

The CP NS-02 and CP NS-03 Contractors will prepare and supply the following equipment:

 - i Pantograph for Limited Express and Commuter trains
 - ii Bogie-assembly for motor-car including traction motor, gearbox, and coupling as for Limited Express and Commuter trains.

- 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

b) GENERAL REQUIREMENTS (ERG)

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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Employer’s Requirements

b) General Requirements (ERG)

1. APPLICATION OF THE GENERAL REQUIREMENTS

1.1. General

- 1.1.1. These General Requirements (ERG) are part of the Employer’s Requirements and form part of the Contract. The provision contained in the Technical Requirements (ERT) and the Employer’s Drawings shall prevail over the provisions contained in the General Requirements. The provision contained in the General Requirements shall prevail over the provisions contained in the Republic of the Philippines standards, Japanese standards, international standards, and similar standards documents stated in the Contract.
- 1.1.2. These General Requirements shall be read in conjunction with the General Conditions (GC), the Particular Conditions (PC), the Technical Requirements (ERT), and the Employer’s Drawings (ERD) and any other documents forming part of the Contract.
- 1.1.3. All of the Plant and Materials intended to form or forming part of the Permanent Works shall be new.
- 1.1.4. The Contractor shall always immediately seek advice from the Engineer in the event of conflicts between the provisions in the documents.
- 1.1.5. The Employer’s Drawings assist the scope of the Works in general and clarify constraints, interface arrangements, and the conceptual nature of the finished system outline. The Contractor shall carefully check all Employer’s Drawings and advise the Engineer of discrepancies, omissions, errors or ambiguities should any be found.
- 1.1.6. The Contractor shall note that any drawings included but marked “For information only” do not form part of the Contract. Dimensions shown on the Employer’s Drawings are indicative only. The final dimensions shall be determined by the Contractor.

1.2. Definition and Abbreviations

- 1.2.1. In addition to the words and expressions defined in the General Conditions and the Particular Conditions, further following words and expressions shall have the meaning assigned to them except where the context otherwise requires:

"approval, approve, approved" when conveyed, given or undertaken by the Engineer or the Employer shall be deemed to mean only that the Engineer or Employer (as the case may be) has no objection to the Contractor’s deliverable, submittal, request, etc., and it shall not under any circumstances constitute a waiver nor relieve the Contractor of any of its duties, responsibilities, obligations or liabilities under the Contract, since ensuring full compliance with the Employer’s Requirements and the provisions of the Contract shall be deemed to be solely the responsibility of the Contractor under all and any circumstances;

“As-Built documents” means the As-Built Drawings and records submitted during completion of Construction such as inspection and test records.

“As-Built Drawings” means those drawings produced by the Contractor and endorsed by it as true records of construction of the Permanent Works and which have been agreed with the Engineer.

“Capital Spares” means those items which are expected to remain in operation and not require replacement until well beyond the end of the 2-year O&M period and which, because of the length of time it would take to get a replacement for such items, could cause a prolonged shutdown if they had to be replaced. The provision of these items is not included in the Accepted Contract Amount and, if required, shall be ordered by the Employer under separate purchase orders not forming part of the Contract. The applicable purchase rates shall nonetheless be those committed to by the Contractor under this Contract, which rates shall remain valid for a period of one year after the end of the Defects Notification Period

“Commissioning” means the process of setting to work the complete transportation system through a series of integrated tests that demonstrate the installation and performance in accordance with the specified criteria.

“Critical Path Method Network” means a networked project implementation program, usually depicted diagrammatically in bar chart form, that contains a logically connected sequence of interdependent activities each having no float, running from the planned start date through to the anticipated finish date, and which results in the longest overall duration for achieving completion of the project.

“Defect Notification Period” means the period during which the Contractor is responsible to remedy any defective work which becomes apparent during the Defect Notification Period (DNP).

“Designer” means who is responsible for the design of permanent works.

“Design Package” means the drawings, documents, structural analysis, simulation and calculation, test reports, etc. prepared by the Contractor.

“External Interfacing Parties” means those parties with whom it is the Contractor’s responsibility to co-ordinate the design of the Contract Works with; and includes all relevant bodies and entities, in particular government authorities, departments and regulatory bodies utility companies, and the consultants, Project Management Units and contractors of adjacent Projects whether ongoing or planned. The Contractor shall identify such interfacing parties in his Interface Management Plan (IMP).

“Execution of the Works” means the manufacture, supply, transportation, delivery to Site, construction, erection, installation, testing, commissioning, performance testing, completion, and training in the use of the Works in accordance with the Contract; the preparation and/or delivery (as appropriate) of all information, drawings and manuals in respect of the Works required by the Contract, the provision of such spare parts, consumables, tools, and spare materials as are required by the Contract to be provided by the Contractor for the performance of its Defects Liability obligations, and the management of all such matters.

“Factory Acceptance Tests” means the tests to be performed at the Contractor’s factories prior to delivery to the Site to verify compliance with the Technical Requirements and quality standards.

“Final Design” means the design developed to the stage where all manufacturing drawings are fully defined and specified.

“Installation Tests” means the tests to be performed to verify the conformity of completion of an installation/assembly to the design documents previously given a Notice of No Objection by the Engineer prior to the start of Commissioning. Installation Tests do not form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer’s Taking Over of the Works or any

Section however they must be successfully completed before the Tests on Completion can commence.

“Integrated Testing and Commissioning” means those tests that demonstrate the integration of the complete transport system meeting the requirements of the Technical Requirements in an operating environment. Integrated Testing and Commissioning form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer’s Taking Over of the Works or any Section. Test Running is part of the Integrated Testing and Commissioning (ITC) following completion of Partial Acceptance Test and System Acceptance testing etc. The O&M Concessioner can join the Employer in witnessing these tests.

“Interface Contractor” means a Contractor, engaged by the Employer, which are undertaking works on the other NSCR-Ex Contract Packages. The Contractor shall identify all such Interface Contractors in the Interface Management Plan.

“Key Personnel” means individuals who are considered by the Engineer to be critical for the Execution and completion of the Works in accordance with the Contract and as listed as such in the Contractor’s Organization.

“O&M Spares” means all those items that the Contractor has advised the Employer will need to be replaced during the O&M period since they do not have longevity beyond two years. The cost of all such items shall be deemed to be included in the Accepted Contract Amount. If any items not included in the list of “O&M Spares” fail during the O&M period and are not capable of being satisfactorily repaired, they shall be treated as defects and must be replaced by the Contractor as soon as reasonably possible, all at no extra cost to the Employer.

“Railway System”: is a general name showing the system consisting of sub-systems; in Track Works, Signaling System, Telecommunications, Power Supply System, Power Distribution System, Overhead Contact line System, Depot facility, and AFC.

“Rolling Stock Gauge” means the maximum profile within which the rolling stock may be constructed or loaded.

“Software maintenance” means activities on debugging, improvement, modification, or replace of software.

“Spare Parts” means those items with a known short operational life that are required to be replaced during the O&M period in order to ensure that there will be no interruption whatsoever due to the failure of such items in the operation of the Permanent Works after handover to the Employer.

“Structure Gauge” means the profile related to the designated normal coordinated axis of the track into which no part of any structure or fixed equipment may penetrate.

“Technical Requirements” mean the requirements set out in Part 2, Employer’s Requirements, Section VI, Technical Requirements (ERT).

“Taking Over” means the point where the Contract Works or any part thereof has passed all relevant tests and can be Taken-Over by the Employer in accordance with Contract Conditions notwithstanding the Contract Works may have certain outstanding works to be completed but nonetheless such will not affect the Employer’s beneficial use of the Contract Works or part as intended by this Contract.

“Temporary Facilities” means the facilities constructed by the Contractor for his own use or for the use of the Employer or the Engineer during the Construction

period which are not intended to become part of the permanent works.

“Temporary Works” means all temporary works of every kind (including, without limitation, false-work, temporary structures, temporary earthworks, and other things), and the goods, materials, and other constituent parts forming or intended to form a part thereof, required for the Execution of the Works but does not include Contractor's Equipment.

“Testing and Commissioning Spares” means all those spares that may be required to ensure that, after all, testing and commissioning work has been completed (including all “Integrated Testing and Commissioning” work), and prior to taking over by the Employer, the work to be taken over is in full compliance with the Employer’s Requirements and is ready to go into operation. The cost of all such items shall be deemed to be included in the Accepted Contract Amount.

“Tests on Completion” means the tests which are specified in the Contract or agreed by both Parties which are carried out before the Works or a Section (as the case may be) are taken over by the Employer.

“Works Program” means the Contractor’s Works program, showing the sequence, design, manufacture, delivery to Site, erection, construction, installation, testing, commissioning of the Contract Works and related activities in the form and content prescribed by the General Requirements (ERG) and Technical Requirements (ERT), or any amended or varied version thereof, as submitted by the Contractor and approved by the Engineer in accordance with the Works Requirements.

- 1.2.2. A common abbreviation used in the ERG and the ERT are set out in alphabetical order in Appendix 1 attached hereto.
- 1.2.3. Further abbreviation may be defined within the body of the ERG or the ERT where there is only local applicability.

2. MOBILIZATION

2.1. Contractor’s Mobilization Program

No more than 28 calendar days after the Commencement Date the Contractor shall submit a mobilization program to the Engineer for his review.

The program shall include a schedule noting the anticipated arrival of all Railway System construction equipment and facilities as well as the arrival of all-key Contractor’s Personnel and Subcontractors.

The mobilization program shall include a layout plan noting the location, size, and arrangement of all Temporary Facilities for the Contractor, including site office, stores, security fencing, entrance and exit gates, sewage and water lines systems, electrical supply, access, and facility roads.

The program shall clearly list all activities requiring the Engineer’s input and reflect any agreements regarding responses outside the standard response time.

The program shall include but not be limited to mobilization of staff, procurement of facilities, information required from the Engineer and deliverables to be submitted.

A narrative that clearly states any assumptions made by the Contractor, any items that the Contractor identifies as being at risk, and any action required to be undertaken by the

Engineer shall support the Mobilization Program.

2.2. Mobilization Requirements

Mobilization shall consist of preparatory and execution works and operations, including but not necessarily limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the work site; for the establishment of offices, buildings, and other facilities necessary to commence work on the Project; and for other work and operations which must be performed, or costs incurred prior to beginning work on the various contract items on the project site.

Mobilization shall include providing submittals as detailed in Appendix 4 and elsewhere in this document. This will include the proposed Organization Chart that shall be submitted for approval by the Engineer.

The Contractor shall complete construction of all Temporary Facilities for the Contractor and mobilization of all Key Personnel, equipment, and plant in such a time frame that the start and progress of works is not delayed due to late mobilization.

3. TEMPORARY FACILITIES FOR THE CONTRACTOR

3.1. General

3.1.1. This section describes the minimum Temporary Facilities with required infrastructure that will need to be provided by the Contractor for the Works. These include, but are not necessarily limited to the provision and maintenance (including all reasonable operating costs) of:

- (1) Site offices, huts, workshops, warehouses, and stores;
- (2) Temporary utilities such as water, electricity, and sewage connections;
- (3) mobile and fixed; Telephones, internet access,
- (4) sanitary, and medical facilities;
- (5) Enclosures, access roads, and fencing;
- (6) Safety procedures for the Contractor's rail traffic and compliance with requirements of the Particular Conditions;
- (7) Provision of an operation and control system for vehicle movements within the site of rail-mounted equipment;
- (8) All necessary police, highway, and utility approvals or authorizations necessary for the Temporary Facilities and controls;
- (9) Material transportation facilities inside the Contractor’s site facilities, like cranes, lifting plant and machinery, with their foundations, rooms, etc. as required;
- (10) Other facilities related to site transportation;
- (11) Road vehicles for material transportation, site transportation, and Work vehicles;
- (12) All equipment to be assigned to the Temporary Works including requirements for ladders, planks, hoists, scaffolding, and similar items;
- (13) Security for the whole of the worksite from access to the commencement of Trial Running.

The Contractor shall use all means necessary to maintain the Temporary Facilities and control in proper and safe condition throughout the progress of the Works, moving as required during the construction of the Works and remove the same from the Site on completion of the Works and ensure that the area is left free of debris, excess materials, and obstructions.

The minimum major Temporary Facilities for the Contractor are described below.

3.2. The Contractor’s Site Offices

The Contractor’s site office shall be provided within or in the vicinity of the work site with all necessary facilities including furniture, office equipment, office supply, utilities services, sanitary systems, etc.

Adequate parking space for the vehicles shall be provided at the site offices.

3.3. Contractor’s Labor Accommodation and Camps

The Contractor shall supply, equip and maintain for the Contract period all his own living accommodation, sheds, and stores necessary for the execution of the Work, and shall make his own arrangements with the owners of any land required and, if necessary, pay for its use.

The accommodation shall comply with the appropriate Government Regulations, and standards like the National Building Code, Republic of the Philippines. No dwelling shall be constructed with non-insulated metal walls, Thatch will not be permitted. Married Quarters as necessary shall be provided in the Contractor's camp. All hutments and buildings shall be adequately equipped furnished. The Contractor shall also construct and maintain adequate roads or paths to all hutments and buildings.

All hutments and buildings must at all times be open to inspection by the Engineer and officers of the public health authorities and any instruction given for the proper cleaning, disinfecting and general maintenance in a building must forthwith be carried out by the Contractor.

Temporary living accommodation for the use of watchmen and a limited number of workers and emergency personnel may be provided by the Contractor within the Site. The accommodation shall be kept clean and hygienic at all times.

The Contractor shall supply, equip and maintain facilities as necessary for the living accommodation such as providing separate living quarters and toilet facilities for men and women personnel, feeding and welfare of its employees by providing, servicing, and maintaining a camp at the Contractor’s Main Site Office or other sites as necessary.

3.4. Warehouse/ Store

The Contractor shall have on the Site a suitable workshop, adequately equipped and provided with utilities, to allow for repairs of the equipment employed to carry out the Works. He shall also provide a warehouse for spare parts for his equipment mainly for the parts that frequently fail or are difficult to procure. A chief foreman qualified for mechanical repairs, with an adequate labor force must manage the workshop.

The Contractor shall provide, erect, construct and equip all offices, workshops, stores, sheds, loading and unloading facilities and the like required by him, complete with all machines and equipment and all services, access roads, rail tracks and the like, required by him for the site depot, in consultation with the Engineer.

3.5. Vehicles

The Contractor shall provide all necessary road vehicles for material transportation at the site depots like trucks (with cranes), trailers, and cars. Vehicles shall also be provided by the Contractor for site transportation of labor where necessary.

Furthermore, the Contractor may also provide road-rail vehicles such as track-type (with cranes), etc. where required for cable laying, material transportation at the sites, etc.

Competent licensed drivers shall be appointed for all the vehicles and the vehicles shall be well maintained throughout the Contract including during the Defect Notification Period.

3.6. Utilities for Temporary Facilities

3.6.1. Water

All water required for and in connection with the equipment and plants, devices, dust control, for settling of backfill material, or for any other use as may be required for proper completion of the Works, shall be provided by and at the expense of the Contractor. No separate payment for water used.

3.6.2. Temporary Power and Lighting

- (1) Temporary power shall consist of temporary power for construction operations and temporary lighting.
- (2) The Contractor shall provide all power for operation of his plant and equipment, or any other use, including cooling and lighting of buildings for use by the Engineer.
- (3) The Contractor shall arrange with the utility company to provide and pay for the service required for power and lighting.
- (4) The Contractor shall provide temporary lighting for all work areas and buildings, to protect the Works and maintain suitable working conditions. Temporary lighting shall be maintained in all areas under the control of the Contractor.
- (5) The Contractor shall provide and install circuit and branch wiring, with area distribution boxes located so that power and lighting are available throughout the construction site.
- (6) Standby Generators with a suitable capacity shall be furnished by the Contractor to cope with the cases of power supply cut-off.

3.6.3. Air Conditioning

The temporary facilities shall be equipped with air conditioning units to provide climate control to the temporary facilities.

3.6.4. Telephone

The Contractor shall make all necessary arrangements and pay all costs for operation

and installation and usage charges of telephone service to the Contractor's offices at the site.

3.6.5. Internet

The Contractor shall provide the necessary arrangement and pay all costs for operation and installation and usage charges of the internet service to the Contractor's offices at the site.

3.6.6. Sanitation

The Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project. Sanitary facilities shall be of sufficient capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. The Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

Separate sanitary facilities for male and female personnel shall be of sufficient capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. The Contractor shall provide separate sanitary facilities accessible to male and female workers. The Contractor shall ensure that the ratio of fixtures for male and female sanitary facilities is 1:2.

3.6.7. Drainage

- (1) The Contractor shall construct and maintain at his own cost a system of surface drainage and waste disposal. Sanitary conveniences for the use of persons employed on the Project shall be provided and maintained by the Contractor in accordance with the appropriate laws and regulations in force in the Republic of the Philippines. All persons connected with the Project shall be obliged to use them.
- (2) For any sudden floods that may occur, pumping and dewatering shall be carried out by the Contractor.

3.6.8. Fire

- (1) The Contractor shall construct, equip and administer at his own cost fire control points in such positions and of such size as will provide an adequate service for the protection against fires on work areas and buildings, stores, and properties on the Site.
- (2) He shall provide and maintain a proper warning system to ensure that fire-fighting equipment can be concentrated on a fire before it has had time to spread.

3.7. Maintenance of Temporary Facilities

The Contractor shall keep all offices, stores, and other areas set up during the Contract clean and litter-free. The Contractor shall be responsible for dealing with all forms of vermin at the Site during the Contract to the satisfaction of the Engineer and in accordance with local authority requirements. The Contractor shall be responsible for maintenance costs and charges arising from the facilities provided or used by him and the Engineer site supervision staff until completion of the Contract.

3.8. Damage to Existing Property

The Contractor will be held responsible for any damage to existing structures, works, materials, or equipment because of his operations or the operations of any of his

Subcontractors. The Contractor shall repair or replace any damaged structures, works, materials, or equipment to the satisfaction of the Engineer, and at no additional cost to the Employer.

The Contractor shall be responsible for all damage to streets, roads, railroads, curbs, sidewalks, highways, shoulders, ditches, embankment, culverts, bridges or other public or private property, which may be caused by the transport of equipment, materials or people to or from the Works.

3.9. Access to Temporary Facilities Sites

The Contractor shall construct entry and exit roads to/from and around all Temporary Facilities. Entry and exit points should be accessible to all personnel, including those with disabilities and those who might find themselves handicapped at any point in the project's development.

Security fencing shall be constructed around all Temporary Facilities. Fencing shall be provided with lockable gates at each entry and exit point.

Suitable external lighting shall be provided at the entrance to all buildings.

3.10. Additional land for Construction Purposes, Detours, Plant and Other Uses

The Contractor shall acquire, if needed, additional working areas in the vicinity of the Works or elsewhere for his camp, yard, for the storage of equipment, for his own office buildings, housing, quarters, stores, plant yard, workshops, offices, and any additional areas required for construction purposes and access or other uses.

Before entering the working site, the Contractor shall give written notice to the Engineer. The Contractor shall give separate notices for each owner and occupier or authority having charge over the working sites.

Before entering any additional working areas, the Contractor shall obtain, and forward to the Engineer, a copy of the written consent of the owner and occupier or authority having charge over the land and stating the purposes for which such land is to be used. The Contractor shall define the extent and periods of occupation for which such consent is granted.

The Contractor shall select, arrange for, and if necessary, pay for the use of sites for construction purposes, detours, plant, and other uses necessary for the execution of the Works.

Before any land belonging to the Government or a private landowner is used for any purposes in connection with the execution of the Work, the Engineer's approval shall be obtained.

Prior to placing the facilities in any area, all clearing and grubbing operations shall be to the satisfaction of the Engineer. The ground elevation of all temporary facilities shall be a minimum of 20 cm above the adjacent existing ground. The surface shall be adequately sloped to allow rainwater to adequately drain.

If any utility for water, electricity, drainage, etc., passing through the temporary site will be affected by the Works, the Contractor shall, at his own expense, provide a satisfactory re-alignment or alternative in full working order to the satisfaction of the owner of the

utility and the Engineer, before the cutting or removal or relocation of the existing utility.

On completion of the Contract, or earlier if so directed by the Engineer, all plant, Temporary Facilities, and any other encumbrances shall be removed, the site and land use areas shall be properly cleaned, all damage made good, and, if necessary, the land-owner paid for the use of the land.

4. PROJECT MANAGEMENT BY THE CONTRACTOR

4.1. Contractor's Management Plans

- 4.1.1. In order to ensure satisfactory execution of the Contract, completion of the Works within specified time, and quality in design, manufacturing, and execution of work, a series of Contractor’s Management Plans shall be developed.
- 4.1.2. The plans and documents shall be coordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organization, and sequencing of activities to meet the requirements of the Employer’s Requirement - Technical Requirements (ERT) in respect of the subjects listed.
- 4.1.3. The respective Plans shall be submitted for the Engineer’s Approval as per the submission schedule furnished in Table 4-1 of Appendix 4 attached hereto.
- 4.1.4. All Plans shall be updated and resubmitted at an interval of between 6 to 12 months as approved by the Engineer.

4.2. Project Management Plan

- 4.2.1. The Contractor shall submit a Project Management Plan, which shall provide a clear overview of the Contractor's organization, the management system, and methods to be used for completion of the Works. The organization resources for the design, procurement, manufacture, installation, testing and commissioning, and setting to work, shall be clearly defined.
- 4.2.2. The Contractor shall submit the Project Management Plan for the Engineer’s Approval as per schedule of Table 4-1 of Appendix 4 attached to hereto. The Engineer will review the Contractor's Project Management Plan and will have the right to require the Contractor to make amendments as deemed necessary. The Contractor shall submit a detailed revised plan within 15 days of the review of the Engineer. The Project Management Plan shall include;
 - (1) A diagram showing the organizational structure for the management of the Contract, with locations, names, and position titles of Key Personnel and their line and staff relationship. The diagram shall include associate organizations and subcontractors and show clearly the individuals and lines of responsibility linking the various groups. It shall also identify the persons designated as contacts with the Engineer. All Key Personnel and those holding senior positions, as designated by the Engineer, shall be given a Notice of No Objection prior to their engagement and mobilization. Approval may be withdrawn at any time in the event of incompetence, non-performance, or misconduct. Any person so removed shall be replaced without delay by a substitute given a Notice of No Objection by the Engineer. The Contractor shall not be entitled to any claim for any expenses whatsoever incurred by him in respect of any direction given by the Engineer under this Clause nor any claim for extension

of time arising from this Clause. All Key Personnel shall be employed on a full-time basis until the issuance of the final Taking Over Certificate or such other time as the Engineer may instruct.

- (2) The names, qualifications, positions, and current resumes of key executive, supervisory, and engineering staff to be employed full-time for the works, separately for principals and subcontractors.
- (3) A narrative describing the sequence, nature, and inter-relationship of the main Contract activities including timing for exchange of information.
- (4) The Deputy Project Manager shall coordinate activities of the design offices and manufacturing works. The Deputy Project Manager shall be responsible to the Project Manager for all works executed outside the Republic of the Philippines and in the Republic of the Philippines for ensuring that effective coordination is maintained with the various manufacturing units of the Contractor, Subcontractors, and Interface Contractors and that contract delivery schedules are met.
- (5) The Project Manager shall, be on-site in the Republic of the Philippines and devote himself full-time to the Project, commencing not later than 30 days after the Commencement Date.
- (6) To fulfill the Contractor’s obligations during the Testing and Commissioning and the Defect Notification Period, the Contractor shall nominate experienced engineers and organize deployment after obtaining the Engineer’s Approval before undertaking testing and commissioning in depot and track.
- (7) The contractor shall engage staff with the requisite professional licenses and certification to undertake the duties to which they have been assigned.
- (8) The Key Personnel and those holding senior positions, as designated by the Engineer, shall be employed on a full-time basis until the issuance of the Taking Over Certificate (or such other time as the Engineer may instruct).

4.3. Interface Management Plan

- 4.3.1. In order to ensure seamless railway systems, the Contractor shall prepare an Interface Management Plan detailing their approach to interface management and coordination with interfacing contractors and third parties e.g., utility providers.
- 4.3.2. Interfacing Contractors shall include but not be limited to the following:
 - (1) Package CP N-01: Viaduct Structure and 2 Stations
(Bridge Works, Calumpit and Apalit Stations Works: 34KM+749 to 51KM+670)
 - (2) Package CP N-02: Viaduct Structure and 1 Station
(San Fernand Stations Works: 51KM+670 to 67KM+440)
 - (3) Package CP N-03: Viaduct Structure and 2 Stations
(Angeles and Clark Stations Works: 67KM+440 to 79KM+560)
 - (4) Package CP N-04: Railway Structure and CIA Station
(Viaduct/At Grade/ Tunnel/ CIA Stations Works: 79KM+560 to 86KM+177)
 - (5) Package CP N-05: Depot Building and Civil Works
 - (6) Package CP NS-03: Rolling Stock – Limited Express Trainsets
 - (7) Package CP NS-02: Rolling Stock – Commuter Trainsets
 - (8) Package CP S-01: Viaduct Structure and 1 Stations

- (9) Package CP S-02: Railway Structure and 4 Stations
- (10) Package CP S-03a: Railway Structure and 3 Stations
- (11) Package CP S-03b: Railway Structure and 1 Stations
- (12) Package CP S-03c: Railway Structure and 2 Stations
- (13) Package CP S-04: Viaduct Structure and 2 Stations
- (14) Package CP S-05: Viaduct Structure and 4 Stations
- (15) Package CP S-06: Viaduct Structure and 3 Stations
- (16) Package CP S-07: Depot Building and Civil Works
- (17) Independent Safety Assessor (ISA)
- (18) Package CP01: Elevated Structures, 7 Stations and Depot;
- (19) Package CP02: Elevated Structures, 3 Stations
- (20) Package CP03: Rolling Stock;
- (21) Package CP04: E&M Systems and Track Works
- (22) Package CP05: Elevated Structures, 1 station.
- (23) Package CP107: Rolling Stock for MMSP;
- (24) Package CP106: E&M System and Track Works for MMSP;
- (25) Package CP101: Civil work and Depot for MMSP;
- (26) Packages CP102,103,104,105 and 108 Civil work for MMSP
- (27) O&M Concessionaires.
- (28) 3rd Party Interfacing parties such as authorities, utility companies, and other Stakeholders.

4.3.3. The Contractor shall develop and submit for the Engineer’s Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto, an Interface Management Plan, The Interface Management Plan shall include:

(1) Scope

Interface management and coordination arising from this contract, with interfacing contractors and third parties.

(2) Interface Management Organization

The contractor shall be responsible for all aspects (Liaise, Interface Identification, Technical Solution, Complementary studies, Implementation planning) of interfacing with third parties.

The Contractors organization shall be such to guarantee timely integration and coordination with other systems and civil works.

(3) Deliverables

a. Interface Matrix

The Contractor shall systematically identify all interfaces and list these interfaces with a brief description and naming of the interface counterparts in an Interface Matrix regardless of the contractual relationship. This Interface Matrix is a live document and shall be update regularly.

b. Interface Agreement

Each Interface must be described with an Interface Agreement which shall define the authority and responsibility of the Contractor and Interface Contractors (and any relevant subcontractors) staff involved in the interface management and development;

Define the information to be exchanged, precise division of responsibility between the Contractor and Interface Contractors, implementation planning (to be compliant with base line program) and integrated tests to be performed at each phase of the Contractor's and Interface Counterparts' works; and

“Child” requirements as a result of interfacing shall be listed in the Interface Matrix.

The Engineer shall review such Interface Agreement and comment with justified observations.

c. Meetings

The contractor shall regularly chair meetings. The frequency shall be adjusted to an as need basis.

(4) Requests for Information

The contractor shall use RFI's (Request for Information) for clarification or to escalate an interface resolution.

4.4. Works Program

4.4.1. Programming Software and Structure of Programs

- (1) Programming software to be used shall be Primavera P6 (Release 16 or later). The program submission shall be in both hard copy and soft copy. Electronic copy shall be in the compatible template with Primavera Cloud. All Programs shall be prepared in terms of durations of days and weeks from the Commencement. “Day” used throughout the contract shall mean “calendar day” and “Week” shall mean “calendar week”. All programs shall be developed as critical path networks, and the Critical Path shall be clearly shown in the bar charts or networks. All programs should be submitted with standard Activity Reports (showing Times, Floats, etc.) and Narrative statements, explaining the programs. A Time Chainage Program shall be prepared using Tilos 7.0 (or latest version) or similar which allows import and export of linear works program with Primavera P6.
- (2) All programs shall be developed by computerized Critical Path Method (CPM) network using the Precedence Diagramming Method (PDM) and shall be presented in either bar chart or time-scaled network diagram format, suitably colored to enable easy reading. The Critical path shall be clearly marked on the bar charts and networks. Cost and resource loading will be done on the program only if the Engineer asks for it.
- (3) Details of the program structure are given in Appendix 2 attached hereto.
- (4) The Contractor shall be responsible for teaching programming software to the Employer’s staff who are monitoring the progress of the Works.
- (5) During the initial mobilization period, the Contractor shall provide the Engineer with four (4) complete sets for each of these software packages (refer to item (1) shown

above) together with all documentation, standalone licenses, and maintenance contracts covering the full duration of the Project from Commencement Date to the issue of the Performance Certificate. The Contractor shall arrange the installation of these software packages as directed by the Engineer.

4.4.2. Different Program Submission Requirement

(1) Program

The Contractor shall submit a program that shall clearly and concisely demonstrates completion of the Milestones and Key Dates and also the whole of the works by the Time for Completion specified. All the programs shall be compatible with each other and shall be in sufficient detail to assure the feasibility of the Contractor's approach to meet the contractual obligations.

(a) Design Submission Program

This shall cover the design phase and include a schedule identifying, describing, cross-referencing, and explaining the design packages and submissions which he intends to submit. It should take due account of the design co-ordination interface periods with other Interface Contractors, as planned by the Contractor. The design stages should be clearly identified and the appropriateness of design sequence and correlation with manufacturing activities established.

The Design Submission Program should take due account of the design coordination interface periods with other Interface Contractors and be consistent with the Works Program.

(b) Works Program

This shall indicate how the Contractor intends to organize and carry out the Works and achieve stages and complete the whole of the Works by the Time of Completion. The Works Program should also meet the milestones of the Contract. The shipment schedule of major components shall be provided as part of the Works Program.

The scheduling approach to the design, manufacture, delivery, installation, testing, and commissioning, integrated tests and any other required tests, and their inter-relationships shall be shown in the Works Program. These shall contain sufficient detail to enable a clear and concise evaluation of the Contractors intentions.

The narrative statement shall also indicate which elements of the Works the Contractor intends to carry out off-shore and/or in the Republic of the Philippines, with details of the proposed locations of where any such work is to be carried out, the facilities available and any third party undertaking the Contractor may have in this regard. In particular, the Contractor must state the assumptions made in respect of the interfaces with the Employer, the Engineer, other contractors, and third parties both in detail and time, and any requirements for information on matters, which would affect his works.

(c) Time Chainage Program

This shall indicate all Key Dates and Access Dates in the contract documents and identify potential interface milestones with other Contractors if these are not be specified in the contract document. It should include all the major activities from

mobilization, site preparation, construction, installation, and testing & commissioning along the alignment.

It should be prepared based on the general approach and method of installation. The construction direction and sequence of works shall be consistent. The planned resources and construction rate should be applied to associated activities.

For the specific works, which are not linear, in the depot, station, and substation, shall be prepared separately (if necessary) and summarized in the overall Time Chainage Program.

(2) Post - Contract Programming Requirements

After the contract award, the Contractor shall submit:

a) Detailed Time Program (Baseline Program)

The Contractor shall develop and detail out his Design Submission Program and Works Program submitted in a Detailed Time Program (including Detailed Works Program and Detailed Design Submissions Program), within 28 days after the Commencement Date. This should incorporate suitable modifications as per the requirements of the Engineer, and amendments to take into account the work of other interfacing contractors.

The program shall make provision for the time required for review procedures, determining and complying with the requirements of all those, whose consent, permission, authority, and license is required prior to the execution of any work.

The Contractor shall note that at the time of submission, his Programs have yet to be coordinated with the other Interface Contractors. These shall not prevent the Contractor from submission of programs using approximate dates for work of the other Interface Contractors (where such dates are not available), which has an impact on the other Interface Contractor's programs. Such programs shall be amended subsequently to take into account the actual schedules of the other Interface Contractors. It is the Contractor's responsibility to ensure timely coordination with all the Interface Contractors to finalize his programs so as not to affect the progress of the Works or those of the Interface Contractors.

The Detailed Time Program shall be reviewed by the Engineer within 21 days. Additional re-submission and review may be required as per the Conditions of Contract. Upon acceptance of the program by the Engineer and the Employer, the Detailed Time Program shall be deemed as “Baseline Program”, against which the progress of the Works shall be measured.

b) Time Chainage Program

This should be updated and submitted with the Detailed Time Program. It will serve as a general guideline for all site activities. Detailed construction program, if required by the Engineer should be developed and aligned to all the start and finish dates in Time Chainage Program. aa

4.4.3. Baseline Program Updating and Revisions

As the Works progresses, it may be necessary for the Contractor to update the Baseline Program, based on the approved variations, actual dates, and progress, but such updating shall only be carried out in accordance with GC8.3 or on the instruction of the Engineer or when directed by the Employer. Any revised program and supporting report shall describe the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within Time for Completion. No revisions shall be made to the contract completion date, except as authorized by the Employer, and as authorized under the Contract. Each revision of the Baseline Program should be submitted with an updated Time Chainage Program if the site activities are adjusted to meet the original or revised completion dates.

4.4.4. The Contractor may be asked to submit by the Engineer, subprograms of a particular portion of the Work or other programs like, what-if programs showing different options, based on work requirement.

4.4.5. It should be noted that once trial operations commence and operation control is undertaken by the O&M concessionaire then there will be restrictions to access the sections which are in his operational control and duration during which works can be undertaken. Works should be planned and undertaken in accordance with these restrictions.

4.5. Quality Assurance Management Plan

4.5.1. The supplying Contract shall be executed within the framework of an efficient quality system. The international standard ISO 9001 is the standards of reference for the QA requirements applicable to the Contractor’s (or subcontractor’s) activities:

- (1) Design,
- (2) Manufacturing,
- (3) On-site activities.

4.5.2. The Contractor shall submit an Outline Quality Assurance Management Plan, illustrating the intended means of compliance with the Employer’s Requirements and setting out in a summary form an adequate basis for the development of the more detailed document. The Outline Quality Assurance Management Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the Contractor’s quality objectives with regard to the requirements of the Contract. Details about Quality Assurance Management Plan to be followed are given in Appendix 5 attached hereto.

4.5.3. The Contractor shall prepare the Quality Assurance Management Plan in detail and carry out the works subject to it.

4.5.4. The Quality Assurance Management Plan submitted to the Engineer for Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto, shall contain sufficient information to demonstrate clearly the proposed method of achieving the quality objectives with regard to the requirements of the Contract.

4.5.5. The Quality Assurance Management Plan shall indicate the approach and structure that the detailed plan will take and shall include the following:

- (1) A summary of the project requirements including all proposed quality activities;

- (2) All quality assurance and quality control procedures proposed by the Contractor for his use in the execution of the Works;
 - (3) A list of all the codes of practice, standards, and specifications that the Contractor proposes to apply to his work; The Contractor shall provide the Engineer and Employer a hard and soft copy of any Standard or Code of Practice referenced in any submission or as may be required in the execution of the works. Should the Standard or Code of Practice be in another language other than English then an English translation shall be provided;
 - (4) The Contractor's proposals for internal and subcontractor quality assurance audits; and;
 - (5) A statement detailing the records that the Contractor proposes to keep, the time during which they will be prepared and the subsequent period and manner in which they will be stored;
 - (6) Quality Control Points and Quality Hold Points during verification, surveillance, tests, trial, and commissioning activities;
 - (7) Procedure for maintenance of records of inspection/tests.
- 4.5.6. The Quality Assurance System shall be applied without prejudice to, or without in any way limiting, any Quality Assurance System that the Contractor already maintains.
- 4.5.7. The Contractor shall maintain the Quality Assurance Management Plan updated during the course of the execution of the Contract. All amendments to the original and approved Quality Assurance Management Plan shall be notified to the Engineer. The quality plan shall comprise:
- (1) A Management Quality Plan for control of management related activities;
 - (2) A Design Quality Plan for control of design-related activities;
 - (3) A Manufacturing (including Inspection and Testing) Quality Plan for the control of related activities;
 - (4) Testing and Commissioning (including Integrated Testing and Commissioning) Quality Plan.
- 4.5.8. The Contractor shall submit a detailed organization chart identifying the responsibilities, authority, and interrelation of all personnel who manage, perform, and verify work involving quality in respect of all the Quality Plans. The organization chart shall be specific to this Contract. The chart shall identify the Quality Management Representative who shall act as the Quality Coordinator for the Contractor in all dealings with the Engineer.
- 4.5.9. The Contractor shall audit all the activities in each Quality Plan at quarterly intervals or other such intervals as the Engineer may require ensuring the continuing suitability and effectiveness of the quality management system. The Contractor shall make available upon request any document, which relates to his recent internal audits.
- 4.5.10. The Engineer will require compliance audits of the Contractor's and suppliers' quality system to be conducted. Not less than two (2) weeks a notice will be given by the Engineer. During audits, the Contractor shall provide suitably qualified staff to accompany the auditors.

- 4.5.11. All suppliers and subcontractors used by the contractor shall be given a Notice of No Objection prior to the commencement of the manufacture and commencement of their works. A detailed submission for each supplier shall be made which shall include as a minimum, scope of works, company organization, experience in supplying product or service, and quality management systems. Supplier familiarization visits, Quality Inspections at the manufacturer’s facilities, First Article inspections, Type Tests, Routines Tests, and Factory Acceptance Tests shall be undertaken for all material and equipment to be supplied for this contract. For all these inspections and tests a maximum of four people will attend from the Employer and Engineer. All costs associated with these inspections either offshore or onshore including transportation, accommodation, insurances, expense, etc. for the Employers and Engineers staff shall be borne by the Contractor.
- 4.5.12. Equipment that has been tested and approved for unconditional and unrestricted use on any passenger-carrying railway by any Railway administration may be exempted from fresh type approval test by the Engineer. However, for this exemption a viable certificate issued by the concerned Railway administration must be submitted to the Engineer for verification and acceptance. The Engineer’s decision will be final.
- 4.5.13. Prior to any Quality Inspections, First Article inspections, Type Tests, Routines Tests and Factory Acceptance Tests, all submissions related to the inspections and tests shall be given a Notice of No Objection.
- 4.5.14. Prior to the start of any construction activities or the installation of any equipment, a mockup shall be constructed which shall be given a Notice of No Objection by the Engineer and shall be used as the standard for all future installation. The items to be included in the mockups and the locations of the mockups shall be agreed with the Engineer.

4.6. System Assurance Management Plan

- 4.6.1. The Contractor shall submit, within 45 days from Commencement Date of the Works, a comprehensive System Assurance Management Plan (SAMP), as per the requirements of the Contract, for the Engineer’s Approval.
- 4.6.2. The Contractor shall carry out the system assurance activity based on EN50126, JIS Standard, IEC62278, or internationally accepted equivalent. The SAMP and program shall be certified by the Contractor’s internal department or by a third-party independent engineer from the design and manufacturing sector. The SAMP shall be specifically developed for this Contract. The SAMP shall address Reliability, Availability, Maintainability, and Safety (RAMS). This shall ensure the E&M Systems has a high degree of reliability and minimized downtime.
- 4.6.3. The SAMP shall also include a configuration management tracing system. This system shall be in place throughout the contract to ensure that all deliverable items of equipment are of the same configuration. All changes to equipment and configuration change control processes shall include the phases of configuration identification, control of changes, and configuration verification.
- 4.6.4. The SAMP shall ensure that the E&M Systems are designed and developed to:
- (1) Be safe, with either proven operational evidence or have adequate evidence-based justifications for their use;

- (2) Be safe including proven electromagnetic compatibility;
- (3) Be certified for revenue service;
- (4) Be reliable;
- (5) Be optimized for maintainability;
- (6) Have high levels of inherent availability.

4.6.5. This plan is intended to provide the basis for integrating system assurance across the Project, leading to the achievement of safety certification and the delivery of world-class RAM performance across the project.

4.7. Site Safety Management Plan

- 4.7.1. The Contractor shall submit a Site Safety Management Plan, which shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures in the installation, assembling, testing, and commissioning of the Railway Systems. The Site Safety Management Plan should include an outline of the safety procedures and regulations to be developed and the mechanisms by which they will be implemented for ensuring safety requirements, site safety, and transportation of Railway System equipment.
- 4.7.2. The Outline Site Safety Management Plan shall be headed with a formal statement of policy in relation to safety and shall be sufficiently informative to define the Contractor’s Site Safety Plan and set out, in summary, an adequate basis for the development of the site safety.
- 4.7.3. The Contractor, its Sub-Contractors and suppliers of any tier and all employees performing any part of the Contract Works on the Site shall comply in every aspect with the provisions of any relevant statutory regulations, procedures manuals, and notices and/or with requirements of Philippines law as may be considered applicable to the Works or “The Guidance for Management Safety for Construction Works in Japanese ODA Project”, September 2014, Japan International Cooperation Agency (JICA), whichever is the more onerous.
- 4.7.4. The Contractor shall submit a Site Safety Management Plan for the Engineer’s Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto. The Site Safety Management Plan shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures and solutions in the installation, assembling, testing, and commissioning of the Railway Systems.

The Site Safety Management Plan shall contain, but not limited to, details of the following:

- (1) A policy statement signed by the top management of the Contractor, declaring that the Contractor shall ensure that safety and health are given the highest priority in all aspects of the Works.
- (2) The statutory and contractual obligations regarding safety and health imposed on the Contractor, and the means by which the Contractor shall supervise, monitor, and audit his site safety assurance system to ensure due compliance with these obligations.
- (3) Site organization structure for safety staff, which shall identify personnel to be

engaged solely on-site safety assurance purposes and shall list their responsibilities;

- (4) The powers vested in the Safety and Health Manager and other safety staff which would enable them to take urgent and appropriate action to make safe the Site and accident prevention practices.
- (5) Emergency procedures and rescue teams. The Contractor shall formulate emergency procedures and organize rescue teams to deal with emergencies on the Site.
- (6) Procedures during typhoons and heavy rainstorms, and emergency organization to maintain safety on Site during typhoons and heavy rainstorms;
- (7) Methods of promoting awareness of site safety and health amongst all persons directly or indirectly associated with the Works.
- (8) The frequency, coverage, and application of accident prevention and safety management courses. All workmen and supervisory staff shall be required to attend a safety induction course before they are allowed to commence work on Site, and thereafter at intervals of not more than six (6) months.
- (9) An accountable record of all trained persons shall be kept by the Contractor. Each individual who has successfully completed training shall be given a unique identity card (ID).
- (10) The safety equipment which will be required for the Works, including the quantity, sourcing, standards of manufacture, storage provisions, and means of ensuring proper and where appropriate mandatory utilization by all workmen and staff employed directly or indirectly by the Contractor.
- (11) Protection of authorized visitors and prevention of entry of unauthorized persons to Site;
- (12) Records to be prepared and maintained by the Safety Officer and safety staff. The records shall include all examination reports and test certificates required under the relevant regulations.
- (13) Regulations and procedures covering all safety and health aspects of the Contract, including but not limited to the following, where applicable:
 - 1) Housekeeping
 - 2) Traffic control and transportation
 - 3) Fire control precautions and Fire procedures
 - 4) Working on the Operation Railways
 - 5) Excavation
 - 6) Welding, cutting operations and equipment
 - 7) Electrical equipment
 - 8) Personnel protection clothing and equipment
 - 9) Lifting cranes, hoists, and other lifting appliances
 - 10) Scaffolding and work platforms
 - 11) Hand tools and portable power-driven tools
 - 12) Structural steel erection
- (14) This Plan shall consider the role of O&M Concessionaire during the staged opening for passenger service; particularly constraints that the O&M concessionaire may impose on sections that are in his operational control. For example, the possibility of restricted access curtailed work durations, etc.

Terms of reference, membership, and frequency of meetings of site safety working groups;

A comprehensive site safety and health checklist which when completed shall serve to record whether the Contractor complies with his statutory and contractual obligations at the time of the inspection.

- 4.7.5. Security of the railway operation shall be the first priority in the Site Safety Management Plan because the accident will cause significant disaster. It should draw attention to the following point, (1) Safety for Works in the Vicinity of Existing operating PNR lines; (2) Safety for Third-Party Disaster that the residents connecting to NSRP-South will concern; (3) Safety for prevention of railway accidents that the working personnel of the works will execute their procedure for. The detail for these three aspects of the Safety Plan are given below:

(1) Safety for Works in the Vicinity of Existing Operating PNR lines

Any adjacent works shall be restricted in order to ensure safety during the train operation. This restriction also includes the use of construction equipment such as backhoes, mobile cranes, and tracked loaders. The use shall not infringe the construction gauge of PNR’s rolling stocks during their operation at any time. Where that equipment will be required to work in and on an area of the construction gauge, the manipulation of the equipment shall be conducted within non-traffic window time of the train operation.

Restricted activities in the vicinity of the PNR lines shall be carefully planned and applications for permission to carry out the restricted activities shall be submitted to the PNR. The restricted activities shall only be carried out after permission is obtained from the PNR and the Engineer. The provisions and approval requirements as stipulated by PNR shall be followed.

Construction activities within the railway protection and safety zones shall be considered restricted activities in the following cases:

- 1) The movement or operation of any crane, whether fixed or mobile, hoist, ladder, drilling or piling equipment, excavator, or any other mechanical equipment or vehicle;
- 2) The installation of boreholes, wells, sheet piles, pile foundations, ground anchors, and horizontal tie-backs;
- 3) The storing and placing, or causing or allowing the storage or placement of, any goods, material or thing or any solid, liquid or gaseous matter or substance;
- 4) The digging or excavation of trenches or pits, the carrying out of earthworks and backfilling, or the shifting or pushing of earth or soil from one area to another, whether or not such activities are carried out manually or by mechanical means;
- 5) The erection of poles, offices, sheds, warehouses, workshops, shelters, tents, scaffolding, maintenance towers, ladders, hoardings, and other similar temporary structures; and
- 6) The use of explosive material for the purpose of blasting, demolition, or removal of rocks.

The slope face of cut and embankment works shall be properly protected so that collapse due to the works will not happen during or after their construction. This protection will ensure to avoid collision between collapsed material and operational rolling stocks and to prevent the obstruction on track rails that causes derailment. It is essential that a

proper retaining wall prevents the collapse of an excavated ditch/pit that may damage an adjacent rail roadbed structure.

Where temporary storages of the construction material and equipment are adjacently located along the railway track, proper clearance between the storages and track shall be kept. This clearance means allocating the storage out of the area of a roadbed level in principle. If the storage will inevitably overlap the roadbed level, the storage shall also be considered that stored goods will not interfere with the train operation in case of a load collapse and scatter.

(2) Safety for Third Parties

It is essential that the hoarding will isolate the construction works from any third party interfacing with MCRP. The hoarding will consist of existing PNR’s fencing and supported by temporary barriers such as crowd control and traffic barrier. These temporary barriers would be arranged at locations that the third-party individuals could easily enter the works site. Such entry points should be equipped with noticeable information boards and picket guards to ensure that individuals entering the site are well informed.

The traffic diversion for the loading and unloading of materials/equipment into site premises shall be managed in safe manner. The traffic diversion shall consist of traffic barriers, markings, signs, and impact attenuators as necessary. In addition, the traffic personnel shall guide construction working vehicles and direct traffic flow on the road. The management plan of this traffic diversion shall also include obtaining consent from the relevant authorities to mitigate the traffic jam due to the relevant works.

Any utilities that will be affected by the construction works shall be protected. This protection shall comply with the regulations of the relevant authorities such as electricity, telecommunication, water supply, sewerage, gas, and the lands owned by PNR itself. Before executing the protection works, each alignment condition shall carefully be identified with visual inspections and official registers. Especially, underground lines shall ensure the identification accompanied by the trial trench if that alignment condition would be controversial between the record and on-site conditions. This trial trench should also observe to detect abandoned lines with surveillance of the relevant authorities.

(3) Safety organization for prevention of railway accidents

The security organization for the works in the railway roadbed level shall be established in accordance with PNR’s safety regulation. This organization provisionally assigns the following responsible personnel:

- 1) A Superintendent who is responsible for this organization for the prevention of accidents. He is obligated to arrange preventive measures and communicates with the relevant department such as stations, operation controls, and maintenance in case of emergency.
- 2) A Foreman who is responsible for the safety instruction and working procedures of their laborer,
- 3) A Railway Watchman who is responsible of the approaching/passing train to motion the personnel for confirming their perception and evacuation, and
- 4) A Laborer who is instructed to execute the works by the superintendent/foreman considering the safety precautions such as the railway track entry, site ambulation, track crossing, prohibition of solo works, and evacuation from the

approaching/passing train.

Railway watchmen shall be assigned in full service at each working site, and this deployment shall also relay information of the approaching/passing train through intermediate one where the direct sight could be impractical. Before starting the works, the deployed watchman shall motion the superintendent/foreman about their readiness. Once the train has been perceived, the watchman shall repeat their motion until the personnel will reply to their perception and evacuation. Then the watchman shall motion the rolling stock operator for a clearance on the track is safe.

The measures for an abnormal case, where accidents may happen, shall immediately be taken with the train protection communicating with the relevant department in order to obey its direction. It should prevent railway disaster with any sort of the following train protection.

- 4.7.6. The Contractor shall erect temporary safety fences and hoarding to prevent unauthorized access to its work sites and to the railway during the works train operation. The design of fences and hoarding, and material use therein shall Site Safety Management Plan be given a Notice of No Objection by the Engineer before starting installation.
- 4.7.7. The Contractor shall designate a member of his staff as a Safety Officer in addition to the Safety Manager. The Contractor shall maintain a First Aid Post at all times when personnel are on Site. First Aid Boxes shall be maintained in a fully equipped state at all times. The Contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering first aid competently until the arrival of professional help, in an accident situation.
- 4.7.8. The Contractor shall be fully responsible for the safety of the Works, his personnel, his subcontractors’ personnel, the public, and any persons directly or indirectly associated with the Works, or on or in the vicinity of the Site. The Contractor shall treat safety measures as high priority in all his activities throughout the execution of the Works.
- 4.7.9. The Contractor shall submit to the Engineer, regular Site Safety Reports, and shall notify immediately the occurrence of an accident involving his staff or that of his subcontractors, or to any person within the area of the Site for which the Contractor is responsible.
- 4.7.10. Other training should include:
 1. Conduct/Ethics/Behavioral Coaching
 2. Gender-Based Violence (GBV) and Sexual Harassment (SEAH) Awareness and Response Training
 3. HIV-AIDS Awareness and Response Training
 4. Other relevant training that the Employer and Engineer may deem necessary.

Employment status should include monitoring of the above-mentioned training content compliance.
- 4.7.11. The Contractor shall be responsible for all matters related to the safety health and welfare of its Sub-Contractors and suppliers of any tier and all employees performing any part of the Works on the Site, and shall comply in every respect with the provisions of all relevant statutory regulations, procedures, manuals, and notices and with all requirements of the Philippine laws as are applicable, including but not limited to:

- (a) ADB recommendations to DOTr concerning COVID-19 dated 21st May 2020:
 - (i) World Health Organization. 2020. Considerations for Public Health and Social Measures in the Workplace in the Context of COVID-19. Geneva.

<https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19>
 - (ii) Government of the United Kingdom. 2020. Working Safely During COVID-19 in Construction and Other Outdoor Work: Guidance for Employers, Employees and the Self-Employed.

<https://assets.publishing.service.gov.uk/media/5eb961bfe90e070834b6675f/working-safely-during-covid-19-construction-outdoors-110520.pdf>
 - (iii) The Canadian Construction Association. 2020. COVID-19 – Standardized Protocols for All Canadian Construction Sites.

<https://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf>

4.8. Software Quality Assurance Management Plan

- 4.8.1. The Contractor shall submit a Software Quality Assurance Management Plan for the Engineer’s Approval as per schedule of Table 4-1 of Appendix 4.
- 4.8.2. The Software Quality Assurance Management shall include the cybersecurity and threat management, the transfer of relevant software copyrights and intellectual property rights.

4.9. Risk Management Plan

- 4.9.1. The Contractor shall produce a Risk Management Plan (RMP) in accordance with ISO 31000 and/or PMI-Standard Practice for Project Risk Management. The Risk Management Plan shall describe how the Contractor intends to:
 - (1) integrate risk management into the team culture, planning, construction activities, and decision-making processes;
 - (2) Anticipate and respond to the changing nature of the works, social, environmental, and regulatory requirements proactively;
 - (3) Mitigate risks pragmatically to a level that is As Low As Reasonably Practicable (ALARP) given the particular circumstances of each situation;
 - (4) Implement a robust and sustainable risk register that is created, maintained, and managed in accordance with the Risk Management Plan, and
 - (5) Ensure consistency and uniformity for all project risk mitigation measures as well as providing a basis for the review and control of the mitigation measures.
- 4.9.2. The Contractor shall, within twenty-eight (28) days of the Commencement Date, prepare and submit to the Engineer his Risk Management Plan in accordance with Clause 4.10.1

- 4.9.3. The Contractor shall, within 30 days of the commencement date and at all times throughout the duration of the Contract, engage at least one Risk Management Representative to be employed and based full time on the Project. The Contractor shall submit the Risk Representative's CV and credentials to the Engineer for approval.
- 4.9.4. The Risk Management Representative shall be suitably qualified (minimum degree qualification in Risk Management or railway/construction/risk related subject) and ideally shall have at least ten (10) years of experience in risk management at a minimum level of Assistant Manager.
- 4.9.5. The Risk Management Representative shall be employed solely on project risk management activities.
- 4.9.6. Risk Organization Structure
- (1) The Contractor shall establish an effective risk management reporting structure to enable structured communication in managing and supporting the risk management process.
 - (2) The Contractors senior site representative (Project Manager or equivalent) shall be responsible for the overall risk management function.
- 4.9.7. Project Risk Management Process
- 4.9.8. The Contractor shall implement a risk management process which shall:
- (1) Identify risks and their associated impact(s) on the Works in terms of design, technical, procurement, constructability, health & safety program, cost, third parties, financial, reputation and political risk along with operational risk, natural event risk, human factor risk and environmental risk & impacts;
 - (2) Analyze risks by estimating the probability of their occurrence and the time and cost impact of each risk event;
 - (3) Minimize the impact of risks on the project objectives through the identification and implementation of appropriate risk mitigation measures;
 - (4) Allocate risks to the most appropriate risk owner and risk Actionee to implement the risk mitigations, and
 - (5) Evaluate the success or otherwise of the implemented risk mitigations and establish the need for further action until the risk can be closed out.
- 4.9.9. Risk Identification
- (1) Within thirty (30) days from the submission date of the Contractors RMP, the Contractor shall undertake an initial risk workshop to consider all associated risks on the Contract and to populate the Contractors risk database. Following the initial populating of the Contractors risk database, the Contractor shall be responsible for the regular updating and use of the risk database as a management tool.
 - (2) The Contractor shall review and update the risks stored in the risk database regularly (at least once every month) to ensure that the risk information is current.
 - (3) The Contractor shall systematically identify all possible risks which have a

potential impact on the Project.

4.9.10. Risk Workshops

- (1) The Contractor shall schedule and attend regular monthly risk workshops to identify, review, and report on risks associated with delivery of the Contract and to continually update his risk database.
- (2) The risk workshops shall be led by a competent member (ideally Project Director) of the Contractor team who has experience in the construction methods proposed and in risk management and shall be facilitated by the Contractor's Risk Management Representative. Other Contractors management staff, including risk owners, and where appropriate, sub-contractors and or other technical specialists who are involved in daily construction activities, shall be required to attend the risk workshops.
- (3) The Contractor shall invite representatives from the Engineer and Employer to attend each risk workshop to assist and actively participate in risk identification and the review and development of associated risk mitigation measures.

4.9.11. The Contractor will utilize Active Risk Manager (ARM), a web-based project risk database, and provide two user licenses for the Engineer and one for the Employer. The Contractor shall maintain a record of all identified risks and issues and opportunities, including their status and history, in the risk database. The Contractor shall be responsible for updating and maintaining the risk database on an ongoing basis throughout the Contract duration.

4.9.12. Treatment of Risks

- (1) The Contractor shall minimize the impact of risks on the project through the identification and carrying out of appropriate mitigation actions. Risk mitigations shall be SMART i.e. specific, measurable, attainable, realistic, and time-bound.
- (2) Risk mitigations recorded in the risk database shall be complete, unambiguous, and sufficient to reduce the risk level So Far As Is Reasonably Practicable (SFAIRP). The risk mitigations shall also be described in sufficient practical detail so that they can be readily understood.
- (3) Risk mitigations for each individual (single) risk shall be allocated to a risk owner, who shall be a staff member of the Contractor, and who shall be responsible for ensuring that the mitigation measures identified on that risk are completed as required.

4.9.13. Risk Monitoring and Control

- (1) Through the monthly risk workshops the Contractor shall review the current risk exposure and as appropriate the probabilities of occurrence and associated impacts.
- (2) Through the monthly risk workshops, the Contractor shall actively monitor the implementation of risk mitigation measures. Any necessary changes to previously agreed mitigations shall be recorded in the risk database.

4.9.14. Risk Close Out

- (1) Residual project risks are defined as those project risks that have a probability of occurrence greater than zero and could affect future railway operations. The Contractor shall use the risk closeout process to identify residual project risks for handover to the Employer at the completion of the handover phase of the Project.
- (2) The Contractor shall submit to the Engineer for approval its Project Risk Close-Out Register before issuance of the Taking Over Certificate. The Project Risk Close-Out Register shall form one of the conditions precedents to issuance of the Taking Over Certificate.

4.9.15. Risk Management Audits

- (1) The Engineer may undertake audits on the Contractor to assess the effectiveness of their implementation of risk management activities as stated in the Risk Management Plan and on the policy and procedures as set out in the Contract. Audits will be conducted once every six (6) months throughout the duration of the Contract.
- (2) Following each audit, a formal audit report will be issued by the Engineer for the Contractor to respond to and take any necessary corrective or preventative actions. Should there be any unsatisfactory observations or non-conformances identified during the audit, the Contractor shall propose to the Engineer, for approval, corrective/preventive actions, together with an appropriate closeout date, within 14 days after receiving the audit report.
- (3) The Engineer will approve the proposed corrective actions and verify and accept the proposed corrective/preventive actions by the Contractor. Subsequently, the Engineer will verify the evidence for closure of the unsatisfactory observation/NCR during the next audit.
- (4) The Engineer will inform and may invite the Employer to attend and observe the audit sessions.

4.10. COVID-19 Risk Management Plan

- 4.10.1. The Contractor shall submit a COVID-19 Risk Management Plan to safeguard all people on Site through a monitoring, education, and PPE approach. Application of the COVID-19 Risk Management Plan shall comply with DPWH Department Order No. 39, 2020 issued 19th May 2020 or any successor to the Order.

4.11. Environmental Management Plan

- 4.11.1. The Contractor shall submit an Environmental Management Plan illustrating the intended means of compliance with the Republic of the Philippines’s standards, law, ordinance, and other regulations on the environment and the Employer’s Requirements. The Environmental Management Plan shall also contain sufficient information to demonstrate clearly the proposed method of achieving the environmental objectives with particular reference to air, water, noise, vibration, and waste.
- 4.11.2. The Contractor shall submit, within 60 days after the Commencement Date, a detailed and comprehensive Environmental Management Plan to the Engineer for approval. The Environmental Management Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the environmental objectives with particular reference to air, water, noise, vibration, and waste together with a monitoring plan. A

Noise and Vibration Analysis Report shall be submitted as part of the Environmental Management Plan. The Contractor shall also comply at all times with any other mandatory requirements, local safety, security, Project Environmental Impact Statement (EIS) report, and other regulations in force and to which the Works are subject, including any requirements specified by the fire brigade.

- 4.11.3. The provisions listed herein regarding environmental protection shall apply to and be binding upon the Contractor for any works on the Site and the persons employed by Subcontractors. The Contractor shall ensure that proper and adequate provisions to this end are included in all Subcontracts placed by him. These provisions shall not be applicable in the case of emergency works necessary for saving of life and property or safety of the Contract Works.
- 4.11.4. The Environmental Management Plan (EMP) shall include the technological approaches which aim to implement an efficient, effective, practical and economical application of the technologies in order to prevent, eliminate or control the negative impacts. Example of the environmental management efforts through the technological approaches are:
- (1) Control air and noise pollution as affected by the operation of heavy-duty equipment in the construction phase;
 - (2) Anticipate the occurrence of erosion and landslides from earthworks;
 - (3) Control the quality of surface water as well as underground water, as affected by construction works and disposal of liquid wastes;
 - (4) Collect and store used oil and lubrication fluids in a drum;
 - (5) Provide temporary toilets; and
 - (6) Anticipate and control any interruption to traffic stability during the construction.
- 4.11.5. The Contractor should comply with the EMP (Environmental Management Plan) and EMoP (Environmental Monitoring Plan) that are described in the latest version of the EIA report for the MCRP and NSRP-South. The Draft EIA’s requirement for the Contractor’s Environmental Management Plan (construction Stage) are given below in Table 4 -1
- 4.11.6. The Draft EIA’s requirement for Contractor’s Environmental Monitoring (Pre-construction Stage) and Construction stage are given below in Table 4 - 2 and Table 4 - 3 respectively
- 4.11.7. The draft plans are for information only and the contractor is expected to prepare a specific plan based on project-specific requirements.

Table 4 - 1: Draft EIA’s Requirement for Contractor’s Environmental Management Plan (Construction stage)

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
Pollution control	Air pollution	Air pollution caused by emissions of gas from construction machine and vehicle, dust from construction works and materials as well as construction traffic	<ol style="list-style-type: none"> 1) Sprinkling water at construction site 2) Proper storage of construction materials including covering sand and gravel that are easily diffused into the atmosphere 3) Covering bulk materials during transportation 4) Regular maintenance of construction machines and vehicle reduce emissions
	Water pollution	<ol style="list-style-type: none"> 1) Discharging turbid water from construction site 2) Generation of domestic wastewater from temporary construction office or related facilities 	<ol style="list-style-type: none"> 1) Discharging turbid water through sedimentation ponds or after simple turbid water treatment 2) Installation of temporary septic tanks or other wastewater treatment facility for workers
	Waste	<ol style="list-style-type: none"> 1) Surplus soil waste and other waste from construction 2) Waste of existing devices replaced with newly installed devices such as bricks, ballast, etc. 3) Solid and liquid wastes discharged from temporary construction office and other facilities 	<ol style="list-style-type: none"> 1) Reduce, reuse and recycle of construction and other types of waste 2) Disposal of waste in a proper way 3) Installation of temporary sanitation facilities such as septic tank at construction office and other facilities
	Noise and vibration	Impacts of noise and vibration by construction machineries and vehicles	<ol style="list-style-type: none"> 1) Installing noise barrier and selecting low-noise equipment as needed,

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
			<p>especially near the residential area and/or sensitive receptor</p> <p>2) No construction activities with heavy equipment during nighttime if there are any sensitive receptors nearby</p> <p>3) Prior notice of construction schedule near the residential area</p>
	Offensive odor	Offensive odor due to excavation or dredging in drainage channels or creek	Consideration of additional mitigation measures depending on an odor source and condition
Natural Environment	Flora, fauna, and biodiversity	Loss of trees and other plant species	Replanting trees in suitable area as needed based on prior consultation with the relevant administrative authorities
	Hydrological situation/drainage system	Potential impacts on hydrological situation or drainage condition surrounding of MCRP&NSRP-South Line due to improvement of drainage system of MCRP &NSRP-South Line	<p>1) Site patrol</p> <p>2) Consideration of additional mitigation measures if any issues are confirmed</p>
Social Environment	Existing social infrastructure and services	<p>1) Road traffic congestion in the surrounding area during the construction period of level crossing and other facilities</p> <p>2) Inconvenience for PNR</p>	<p>1) Advance announcement of construction schedule</p> <p>2) Preparation and implementation of the Traffic Management Plan by the Contractor including arrangement of watchmen and detour road signs</p>
	Infectious diseases such as HIV/AIDS	Risks for infectious diseases due to inflow of construction workers	Awareness of public health for workers and local communities
	Working condition including occupational	1) Accidents in the operation of construction machinery and other works	<p>1) Compliance with the requirement of Labor Law</p> <p>2) Preparation of a safety</p>

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
	health and safety	2) Risk of occupational health and safety for workers in case of severe working conditions	and health management plan and enlighten occupational safety to workers 3) Providing proper personal protective equipment (PPE) such as helmet, safety jacket, gloves, and safety shoes for workers
Others	Traffic accident	The risk of accidents would be higher for passengers, informal occupants, and other nearby residents due to their habits of crossing railway lines and the land of PNR by walk and occupation on railway yard and the land of PNR with shops, huts, and vendors	Manage the construction site to prevent local people from entering the site by barricading and the site security gate.
	Climate change	GHG emissions from construction vehicles and machines	Saving on electricity in construction sites and offices such as vehicle idle reduction.
	Hazardous materials and oil management	Spoil of fuel or hazardous substance that is used for construction work	Training workers on appropriate handling of fuels and chemicals Measures for spill control and leakage control system

Table 4-2: Draft EIA’s Requirement for Contractor’s Environmental Monitoring (Pre-construction stage)

Category	Key Monitoring Item	Location	Frequency
Common	1) Review and update of the Environmental Management Plan based on the detailed project design 2) Preparation of safety management plan for construction phase	Project area	Once before commencement of construction work

Table 4-3: Draft EIA’s Requirement for Contractor’s Environmental Monitoring (Construction stage)

Category	Key Monitoring Item	Location	Frequency
Common	Progress of conducting mitigation measures	Project area	Monthly and quarterly during the construction period
Air quality	1) Site patrol 2) Checking received complaints from residents 3) Monitoring of air quality	Representative point(s) of construction site(s)	1) Monthly 2) Whenever received 3) When needed
Water quality	1) Site patrol 2) Monitoring of parameters stipulated by National Environmental Quality (Emission) Guideline	Creeks nearby construction site(s)	1) Monthly 2) Biannually
Waste	1) Site patrol and housekeeping at construction site 2) Checking waste-disposal method	Construction site(s)	1) Monthly 2) Monthly
Noise and vibration	1) Site patrol 2) Received complaints from residents 3) Monitoring the noise and vibration level	Construction site(s)	1) Monthly 2) Whenever received 3) When needed
Cutting of trees	1) Check of species and number of trees that need be cut 2) Prior consultation with the relevant administrative authorities in charge.	Construction site(s)	1) Quarterly 2) Once or more
Existing social infrastructure and services	1) Collection of complaints 2) Physical observation of road traffic condition 3) Interviewing/discussing with Traffic Police	Construction site(s) and surroundings	1) Whenever received 2) Every day of the construction period 3) When necessary
Infectious diseases such as HIV/AIDS	1) Received complaints from residents 2) Record of awareness activities	Construction site(s)	1) Quarterly at minimum 2) Quarterly
Working condition including occupational health and safety	1) Site patrol 2) Record of implementing the safety and health management plan	Construction site(s)	1) Monthly at minimum 2) Quarterly
Traffic accident	1) Site patrol 2) Record of accidents 3) Record of safety-awareness campaign and other measures	Construction site(s)	1) Monthly at minimum 2) Monthly 3) Monthly

Category	Key Monitoring Item	Location	Frequency
Hazardous materials and oil management	1) Site patrol to check the condition of handling or storing hazardous materials 2) Record of training on handling hazardous materials for workers	Construction site(s)	1) Monthly 2) Quarterly

4.11.8. The Contractor shall submit, within 60 days from Commencement Date of the Works the following for the Employer’s assessment and approval:

1. Code of Conduct

The Contractor shall furnish a copy of their Code of Conduct which should include specific prohibitions against GBV, and in particular, a prohibition of any sexual activity with children, defined as anyone under the age of 18, residing in the project area. It shall also further define a range of sanctions proportionate to the event, for example, warnings for incidents of community harassment, such as catcalling, versus dismissal for incidents of sexual abuse.

2. GBV Action Plan

A GBV Action Plan, which should include mechanisms, sanctions, and mitigation procedures in handling GBV-related cases during project implementation. The GBV Action Plan must be compliant with the Legal and Policy Framework provided by the Employer. It shall properly address the requirements stated under GC 6.8, 6.9, and 6.11.

The Contractor has the following options in formulating the GBV Action Plan:

- (i) **Sub-Contracting a local GBV Service Provider**
The Contractor has the option to subcontract a local GBV Service Provider to handle GBV-related cases during project implementation. The Contractor shall submit a company profile of their nominated GBV Service Provider as part of the Bidding Documents, for the Employer’s assessment and approval. The nominated GBV Subcontractor must provide items listed in Section (ii), to measure their capacity in handling GBV-related cases for the project.
- (ii) **Formulation of a project-specific GBV Action Plan**
Contractors should demonstrate that they have the capacity to manage GBV risks. For the project’s GBV risks to be properly addressed, it is necessary to have an effective ‘GBV Action Plan’, which outlines:
 - How the project will put in place the necessary protocols and mechanisms to address the GBV risks; and,
 - How to address any GBV incidents that may arise.
The GBV Action Plan needs to include specific arrangements for the project by which GBV risks will be addressed. This includes components such as:
 - Awareness Raising Strategy, which describes how workers and

local communities will be aware and sensitized to GBV risks, and the Employer’s responsibilities under the CoC;

- Policies Governing the Workplace, which details clear policy regarding non-tolerance of sexual harassment in the workplace. These are also expected to be included, as minimum requirements, in the Contractor’s Code of Conduct. Illustrative templates should be developed for these policies.
- GBV Intake Mechanism, which will detail how the Employer will receive GBV-related complaints, data- gathering in relation to the complaints, and the necessary subsequent procedures thereafter;
- GBV Referral Mechanism, to which the Employer will refer GBV survivors to necessary government offices, local police, and other potential sources of further action and services;
- GBV Monitoring and Evaluation Strategy, which describes the safety measures to be implemented for the benefit of monitoring the general condition of the project;
- GBV Allegation Procedures; how the project will provide information to employees and the community on how to report cases of GBV CoC breaches to GRM.

4.12. Inspection, Testing, and Commissioning Management Plan

- 4.12.1. The Contractor shall submit an Inspection, Testing, and Commissioning Management Plan as per schedule of Table 4-1 of Appendix 4 attached hereto, for the Engineer’s Approval as specified in Chapter 9 of this Employer’s Requirement - General Requirement (ERG) and required in the Employer’s Requirement - Technical Requirement (ERT).

4.13. Earthing and Bonding Strategy Plan

- 4.13.1. The Contractor shall submit for approval an Earthing and Bonding Strategy Plan which shall include such items as methods of earthing, separation, resistance values, etc. This document will ensure consistency across multiple Civil and E&M Systems Contractors.

4.14. Review Periods for Contractor's Submissions

- 4.14.1. The Engineer shall review those Contractor's plans, designs, and program submissions which require his Approval or otherwise within 21 days from receipt of the hard copy of the submissions. The Contractor shall re-submit his plans and programs within 14 days of the receipt of the Engineer’s comments.

The Engineer will endeavor to review and respond to the Contractor on the adequacy and acceptability of the Contractor's submissions and re-submissions as soon as reasonably possible, but the Contractor should always allow for a 21- day review period.

The Contractor shall allow in his program a 21-day review period for all submissions to the Engineer.

Any submissions received that do not meet the required quality and content shall immediately be rejected by the Engineer and shall not be subject to review.

4.15. Failure to Make Submissions

- 4.15.1. Failure of the Contractor to submit any plan and program, or any required revisions thereto within the time limits stated shall be sufficient reason for certification that the Contractor is not performing the work required in a timely manner. The Engineer may certify retention of payment under the Milestone-related Cost Center proposed for the Contractor until his plans and programs are accepted/consented by the Engineer.

4.16. Plans and Program Revision

- 4.16.1. The Contractor shall revise his plans and programs whenever necessary, with the consent of, or as required by the Engineer to ensure completion of the Works within the Time for Completion for the Works.

4.17. Planning and Programming Staff

- 4.17.1. The Contractor shall employ sufficient number of planning and programming staff competent in the use of the programming software and with a good knowledge of the type of work required to be performed by the Contractor under the Contract.

The Engineer shall have the discretion to require the Contractor to replace his planning and programming staff if the Engineer considers that they do not have the training or skill required for this specialized nature of work.

4.18. Project Calendar

- 4.18.1. Project Weeks shall commence on a Monday. A day shall be deemed to commence at 0001 hours on the morning of the day in question. Where reference is made to the completion of an activity or Milestone by a particular week, this shall mean by midnight on the Sunday of that week.

4.19. Progress Reporting

- 4.19.1. Progress Reports, as detailed in Appendix 3 attached hereto, shall be regularly submitted by the Contractor, on a monthly basis.
- 4.19.2. The contractor shall submit weekly progress dashboards, one for the overall contract, and other individual dashboards for each railway system. The dashboards shall be accompanied by a detailed Material Control Schedule which tracks and records all material procurement activities. The formats used are to be agreed upon and given a Notice of No Objection by the Engineer.

4.20. Co-ordination and Interface with Interface Contractors and Others

- 4.20.1. The Contractor is responsible for detailed co-ordination of his design, manufacturing, construction, testing and commissioning activities with those of the Interface Contractors and Consultants whether or not specifically mentioned in the Contract, who may be working for the purpose of the Project. The interfaces also cover all works undertaken on adjacent projects such as MMSP and NSCR.
- 4.20.2. The Contractor shall note that there are other contractors, consultants, agencies, etc. which the Employer may engage from time to time, and with whom the Contractor shall have to similarly co-ordinate. Such coordination responsibilities of the Contractor shall include the following, but need not be limited to:

- (1) To provide all information reasonably required by the Interface Contractors in a timely and professional manner to allow them to proceed with their design, manufacturing, construction activities, and to meet their milestones and work program dates, if any.
- (2) To ensure that the Contractor's requirements are provided to all other Interface Contractors, in a timely and reasonable manner.
- (3) To obtain from the Interface Contractors information reasonably required, to enable the Contractor to meet his own design submission dates.
- (4) To ensure close coordination with the contractors in charge of the Signaling System in respect of the provision of Signaling System equipment in the cars and finalizing the interface between the rolling stock and Signaling System equipment.
- (5) Where the execution of the work of the Interface Contractors depends upon the site management or information to be given by the Contractor, the Contractor shall provide to such Interface Contractors the services, or the correct and accurate information required, enabling them to meet their own program or construct their own works.
- (6) To ensure that there is no interference with the works of Interface Contractors.
- (7) To attend regular coordination meetings convened by the Interface Contractors and the Engineer. The Contractor shall conduct separate meetings with the Interface Contractors as necessary to clarify particular aspects of the designated requirements of the Works. A record of the decisions taken in each such meeting shall be furnished to the Engineer. The party who convenes the meetings shall prepare minutes recording all matters discussed and agreed at the meeting.
- (8) To ensure that all correspondence, drawings, meeting minutes, programs, etc. relating to the Contractor's coordination with the Interface Contractors are issued to all concerned parties and four copies issued to the Engineer no later than seven calendar days from the date of such correspondence and meetings.

4.20.3. The Contractor shall, in carrying out his co-ordination responsibilities, raise in appropriate time and provide sufficient information for the Engineer to decide on any disagreement between the Contractor and the Interface Contractors as to the extent of services or information required to pass between them.

4.20.4. If such disagreement cannot be resolved by the Contractor despite having made all reasonable efforts, then the decision of the Engineer shall be final and binding on the Contractor.

4.20.5. Where an Interface Contract is yet to be awarded, the Contractor shall proceed with the co-ordination activities with the Engineer until such time as the Interface Contractor is available. The Contractor shall provide the Interface Contractor with all information necessary to enable the Interface Contractor to follow-on and proceed with their co-ordination.

4.20.6. Any claim of additional costs by other Interface Contractors as a result of the Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and

updating of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each design stage by the specified dates.

- 4.20.7. The Contractor shall establish a dedicated Interface co-ordination team of managers, engineers, supervisors, technical staff, experts, and support staff, led by an Interface Coordinator reporting to the Contractor's Project Manager. The primary function of the team is to provide a vital link between the Contractor's design and manufacturing teams and the Interface Contractors. The Engineer shall have the right to require the replacement of the Coordinator if in his opinion the Coordinator is unable to meet the coordination requirements of the Contract. The Contractor's attention is drawn to the need for the Coordinator to establish effective dialogues and communication links with the Interface Contractors. The Contractor's coordination team shall comprise a mix of personnel with experience in both design and manufacture of rolling stock necessary for effective coordination.
- 4.20.8. The Coordinator shall assess the progress of co-ordination with the Interface Contractors by establishing lines of communications and promoting regular exchange and updating of information so as to maintain the Contractor's program.
- 4.20.9. The complexity of the Project and the importance of ensuring that the work is executed within time limitations require detailed programming and monitoring of progress so that early program adjustments can be made in order to minimize the effects of potential delays.
- 4.20.10. The Coordinator in conjunction with the Interface Contractors shall identify necessary provisions in the Works for plant, equipment, and facilities of the Interface Contractors. These provisions shall be allowed by the Contractor in his design of the Works.
- 4.20.11. During the course of the Contract, information will be obtained in a number of ways, including direct inspection, regular site meetings, the obtaining of progress reports, and the use of turn around documents to obtain design and program data. Turnaround documents shall be issued to the Interface Contractors to be returned giving the current positions on their program.

4.21. Spare Parts Management Plan

- 4.21.1. The Contractor shall submit for Approval by the Employer a Spare Parts Management Plan. This plan shall include, but not limited, to the following:
- (1) List of O&M Spares
 - (2) Quantities of O&M Spares together with calculation to determine holding and usage.
 - (3) List of proposed Capital Spares and lead for purchase by the Employer.
- 4.21.2. The Contractor shall submit the Spare Parts Management Plan not later than twelve (12) months prior to the issue of the Taking Over Certificate for a System, a Section, or the Works.

5. WORKS TRAIN OPERATIONS

5.1. Requirements during the Construction

- 5.1.1. The Contractor shall implement works train operation which shall be in accordance with the Works Train Manual that has been given a Notice of No Objection by the Engineer.
- 5.1.2. The Contractor shall prepare for Approval and implement a Works Train Manual that will cover the operation of its works trains and the management of access to the site: The manual shall cover, but not be limited to, the following topics:
 - (1) General Safety Requirements, including training and qualification, accident prevention, riding on works train, track crossing and clearance, safety inspection, work train notice, personal protective equipment, warning sign and notices, smoking, etc.;
 - (2) Definitions of Defined and Restricted Areas.
 - (3) Communication Rule, including the use of communication equipment, radio communication rules, hand signals, train horn signals, and line side signage;
 - (4) Signal Rules including signal types and meaning, and safety requirements and precautions to be observed while operating works train, etc.;
 - (5) Rule Governing Track Access and possession’s etc.; for all contractors engaged on this project.
 - (6) Management of access for all parties and planning through regular Works Trains Meetings.
 - (7) Work Permits for high risk works such as working at height, confined space, hot work, lifting work, etc.;
 - (8) Work Train Operations Rules for normal, degraded, and emergency operation and include planning of works train activities, execution of works train activities, fault reporting and handling, adverse weather arrangement, incident and accident management and investigation, etc.;
 - (9) Turnout and Switch Operation including qualification of switch operator, turnout and switch operation safety requirements and work process;
 - (10) Traction Power Control Rules, including general operation safety requirement, emergency power cut, authorization to interrupt traction power supply, power isolation for engineering possession, testing electrical power supply to the power rail, use of power rail short circuit device, local operation of traction power switchgear and transfer switch, confirmation of clear area, notification of traction power supply restoration, permission to restore traction power supply, etc; and
 - (11) Track Trolley Operation Rules including types of track trolleys, restriction on the use of track trolleys, personal protective equipment to be worn when using a track trolley, loading and unloading, pre-use check (wheels & brakes), warning lamps, operating a track trolley, moving over points, securing and storing a track trolley when not in use, etc.
- 5.1.3. Whilst working in the tunnel sections additional suitable ventilation shall be provided by

the contractor to ensure air quality standards are met and that an airflow of 0.3 m/s is maintained.

- 5.1.4. The contractor shall provide portable earths and live line testers to ensure construction work undertaken by any party will remain safe when being undertaken in the vicinity of energized tracks.
- 5.1.5. The contractor shall provide all multi-aspect lamps and flags and associated equipment for protecting the work site during possessions
- 5.1.6. A temporary communication system and equipment for the works train operation such as portable radios shall be provided. Additionally, other communication equipment shall be provided to allow communication with all other Works Train operation staff.
- 5.1.7. Prior to the track becoming a Defined Area all-access, egress, and areas close to the track shall be secured with necessary barriers and signage provided and installed by the Contractor.
- 5.1.8. The Contractor shall be responsible for managing all access and permits to the railway until handover to the Employer for commencement of Operations.

6. DESIGN SUBMISSION REQUIREMENTS

6.1. General

- 6.1.1. The objective of the design submission process is to ensure that the proposed resulting works comply with the ERT, are capable of being produced consistently to exacting quality standards, achieve low life cycle costs, and can be operated safely to the satisfaction of the Engineer.
- 6.1.2. The system and all equipment shall be able to withstand the environmental conditions experienced along the entire NSCR alignment. Where figures are not stated the contractor shall submit for approval the conditions to which the design has been based which shall include temperature, relative humidity, solar radiation, wind velocity, lightning, vibration and shock, proximity to coastal areas, flood and earthquake.
- 6.1.3. The design submissions include Design Reports, which shall include design calculations, simulation and calculation, and all other design-related information and Design Drawings.
- 6.1.4. In the event that a statutory body (e.g., Government of Republic of the Philippines - Department of Transport, etc.) requires design information in a particular format, it shall be incumbent upon the Contractor to provide the same, as directed by the Engineer.

6.2. Review of Data

- 6.2.1. As soon as practicable after Contract award, the Contractor shall review all applicable data, criteria, standards, directives, and information provided to him as the basis for design. Any apparent inconsistencies or erroneous information shall be brought to the attention of the Engineer. Such information shall not alleviate the Contractor from his responsibilities under the Contract.

6.3. Format of Deliverables

6.3.1. The format and exchange of all deliverables shall be in accordance with the “BIM Information Management Flow” which shall be issued by the Engineer.

6.3.2. Drawing and CAD Standards. Reports, calculations, specifications, technical data, and similar documents shall be provided in A4 format, and one of the copies shall be ring bound to facilitate photocopying. A3 size drawings included in documents shall be folded to A4 size.

6.3.3. Drawing and CAD Data Format:

Within 30 days after the Commencement Date, the Contractor shall have prepared and submitted the Drawing and CAD procedure together with sample drawings and corresponding CAD data to demonstrate his understanding and compliance with Drawing and CAD Standards.

6.3.4. Building Information Model (BIM) Execution Plan for LOD 100 to 500

Within 30 days after the Commencement Date, the Contractor shall submit their BIM Execution Plan for LOD 100 to 500. The contents of this plan shall cover:

- (1) Equipment to be deployed;
- (2) Project Information;
- (3) BIM design process;
- (4) BIM information exchange;
- (5) BIM and Facility Data Requirement;
- (6) Collaboration and interfacing procedures;
- (7) BIM Model Quality control procedures;
- (8) BIM model structure;
- (9) Technology Infrastructure Needs;
- (10) BIM Project Deliverable;
- (11) Delivery Strategy;
- (12) Virtual Design Reviews and Clash Analysis.

The contractor shall produce all designs in internationally accepted and CAD and 3D formats given a Notice of No Objection by the Engineer. The details are of which are to be provided given a Notice of No Objection by the Engineer. The Contractor shall develop BIM models of all elements as a single system/discipline 3D model; each model shall be spatially coordinated in conjunction with the BIM models of the civil works and interfacing works, provided progressively by the Engineer and Interfacing Contractors, into a three-dimensional federated model using 3D object-based software; allowing for the fully coordinated design drawings to be annotated and extracted as required.

The final “as-built” model shall be LOD 500 (as per CIC BIM Forum LOD definition).

All the Contractors shall propose and submit to the Employer and Engineer the Line Replacement Unit (LRU) level for the BIM to identify the details on interface with

CMMS.

6.4. Number of Copies

6.4.1. The following quantities of drawings and other documents shall be submitted to the Engineer, including preliminary, pre-final, and final design submissions, the final contract document, and all other submissions. These drawings and documents are in addition to those required for the exchange of information between the Interface Contractors and other submissions to statutory, governmental, and local authorities if required.

- (1) 4 full-size sets of paper drawings (folded and collated)
- (2) 4 sets of Design Reports including design documents and calculations, structural analysis, simulation and calculation, and all other design-related information.
- (3) 4 sets of all other submissions.
- (4) 2 sets of each of the above in electronic format

6.5. Design Submission Program

6.5.1. The Contractor shall prepare the Design Submission Program which sets out fully the Contractor's anticipated program for the preparation, submission, and review of the Design Packages, the Final Design Submission, and the Installation and Manufacturing Drawing Submissions and for the Issue of Notices in relation thereto.

6.5.2. The Design Submission Program shall:

- (1) be consistent with and its principal features integrated into the Works Program, and show all relevant major activities;
- (2) identify dates and subjects by which the Engineer’s decisions should be made;
- (3) make adequate allowance for periods of time for review by the Engineer;
- (4) indicate the Design Interface and Coordination requirement and periods for each Interface Contractor;
- (5) include lists of requisite design details for each and every component or equipment of all systems.

The Contractor shall update the Design Submission Program suitably if the Engineer observes any deviation.

6.5.3. For the system and components of the Works or the Plant, the Contractor shall submit documents and drawings describing function description, product description, interface requirement description, RAM requirement description, life cycle calculations, type and routine test specifications, list, and details of spares, related calculations, etc. The Design Submission Program shall also include a listing of various plans, processes, and other submissions.

6.6. Design Process

6.6.1. The Contractor shall deploy the staff having sufficient experience in the design of similar works at all times to maintain liaison with the Engineer. The principal requirement of the design phase is to undertake the design during this phase in three stages:

- (1) the preparation of the Preliminary Design;

- (2) the preparation of the Pre-final Design; and
- (3) the preparation of the Final Design.

6.7. Preliminary Design

6.7.1. The purposes of the Preliminary Design submission are as follows:

- (1) State the design criteria;
- (2) Design the overall system, and propose the system configuration;
- (3) Identify the functions of each system, equipment, or other elements within the overall design, and specify the relationships and interfaces between elements of the system;

6.8. Pre-Final Design

6.8.1. In the Pre-final Design stage, the Preliminary designs (including interfaces with those of Interface Contractors of the Employer, and the Contractor's vendors) are required to be fully developed. In this stage, each element of the system will be considered and preliminary specifications with supporting calculations developed. Preliminary electrical and control schematics shall be developed to illustrate how various operational and functional requirements are achieved including structural analysis, simulation, and calculation. Software design and development shall also be carried out at this stage.

6.8.2. Manufacturing can only commence after receiving Approval from the Engineer. This submission shall include sufficient detail from prospective suppliers to demonstrate that they have an adequate understanding of the requirements. It will include either evidence of or proposals for design verification such as analysis and simulation. Interfaces with other Interface Contractors shall be finalized by this stage.

6.9. Final Design

6.9.1. The purpose of the Final Design submission is to agree with the Engineer that the equipment is satisfactory, compliant with the specification, fit for purpose, and safe. The Final Design shall be the level of design developed to the stage where all manufacturing drawings (including those received from Interface Contractors of the Employer, and vendors of the Contractor) are fully defined and specified and in particular:

- (1) Calculations and analyses are complete;
- (2) All main and other significant elements are delineated; and
- (3) All other works, including studies, investigations, and reports are complete.

6.10. Design Submission and Review Procedure

6.10.1. All design submissions from the Contractor shall be accompanied by a Design Review Certificate Application (DRCA) notice. The forms and numbering system of the DRCA notice shall be subject to the issuance of a Notice of No Objection by the Engineer.

6.10.2. Upon receipt of design submissions from the Contractor, a copy of the DRCA will be signed, dated, and returned by the Engineer.

6.10.3. The Engineer shall issue a Design Certificate Consent (DCC) Sheet properly dated and numbered to the Contractor for each of the DRCA. The DCC will carry status as Notices of "Reject", "Notice of No Objection with Comments", "Notice of No Objection" and decisions made by the Engineer in response to the DRCA made by the Contractor. The

DCC sheet properly dated and numbered shall be sent to the Contractor. The consent sheet number shall be the same as the Design Review Certificate Application number except that the letters "DRCA" are replaced by "DCC".

- 6.10.4. When significant comments are noted by the Engineer on the design submission, the DRCA shall be returned "Rejected", and signed by the Engineer. One copy of the DRCA shall be returned to the Contractor together with the comments on why the submission was rejected.
- 6.10.5. When minor comments are noted by the Engineer on the design submission and it is "Notice of No Objection with Comments" the DRCA will have the appropriate decision indicated upon it and be signed by the Engineer. One copy of the DRCA, together with comments, will be returned to the Contractor.
- 6.10.6. A submission will be rejected automatically if not signed by the Contractor's Representative or the Contractor's Authorized Design Representative.
- 6.10.7. Upon receipt of a decision sheet from the Engineer, the DCC will be signed, dated by the Contractor, and returned to the Engineer.
- 6.10.8. To ensure efficient information management on the project the Engineer has determined that a web-based Electronic Document Management System (EDMS), shall be the only recognized method of transmittal for formal project correspondence, documents, drawings, models, data, and information. Where it is necessary to transmit original signed documents, these shall be acceptable forms of correspondence only when they have been issued via the EDMS. The format of all transmitted files shall be in both the native form and the Portable Document Format (PDF).

The Contractor shall use the EDMS selected by the Engineer during the whole project life cycle. The EDMS shall be used by all participants engaged on the Project, including the Contractor, Interface Contractors, Subcontractors, sub-Subcontractors, manufacturers, suppliers, and their subsequent legal successors in title.

All costs associated with licenses and/or tokens required for the EDMS shall be borne by the Contractor.

6.11. Engineer's Review

- 6.11.1. The Engineer will complete his review of the submission within 21 calendar days, after which the review comments will be furnished to the Contractor in writing. The Contractor shall then meet with the Engineer to discuss the review comments. Within two weeks of the receipt of the Engineer's comments, the Contractor shall submit his proposals for implementation in the next submission. Where the comments are minor, such proposals may be clarified by calculations, part prints, etc. acceptable to the Engineer and included in the Contractor's next submission.
- 6.11.2. After the Engineer reviews the design submissions, the Contractor shall update the documentation incorporating the Engineer's observations and also other design requirements. For all subsequent submissions, the Contractor shall demonstrate that all the previous comments by the Engineer have been incorporated. The Comments previously issued by the Engineer shall also become part of the submission.
- 6.11.3. The design submissions for the relevant design of Railway Systems shall require Approval by the Engineer.

- 6.11.4. Any submissions received that do not meet the required quality and content shall immediately be rejected by the Engineer and shall not be subject to review.

6.12. Final Design Document Delivery

- 6.12.1. To achieve agreement with the Engineer on the completion of the design and to allow the formal submission of the Final Design, the Contractor shall submit a list of all accepted design submissions to the Engineer for review along with self-adhesive stickers signed by the Contractor's Representative. If there is Approval by the Engineer, he shall then sign and return the self-adhesive stickers to the Contractor for affixing to the amended Final Design documents including Drawings (original) prior to their submission under the Final Design Document Delivery.
- 6.12.2. Based on the Engineer's review of the Final Design Submission, the Contractor shall then re-submit the entire Final Design Submission together with the following documents:
- (1) joint statements of completed design interface with the Interface Contractors of the Employer, if applicable;
 - (2) a signed statement confirming that he has incorporated all comments of the Engineer;
 - (3) a Design Certificate duly endorsed, in the form accepted by the Engineer.

These above jointly will be known as "Final Design Document Delivery".

6.13. As-Built Drawings and Records

- 6.13.1. The As-Built Drawings are intended to show the Works exactly as constructed. These are prepared by amending the installation and manufacturing drawings to take into account changes necessitated by manufacturing methodology. These drawings shall be completed on a regular basis as the Works progress.

The As-Built Records shall include all record photographs, all test results, and all inspection records and shall be endorsed by the Contractor as true records of the execution of the Works.

The Contractor shall supply to the Engineer, the required numbers and types of copies of the relevant As-Built Drawing/Completion Drawings. The Works shall not be considered to be completed for the purpose of taking over until the Engineer has received these drawings.

- 6.13.2. Two full-size sets of paper copies and one set of electronic files of the As-Built Drawings shall be submitted to the Engineer prior to the commencement of the Tests on Completion.

Prior to the issue of the Handover Certificate and in accordance with the Conditions of Contract, the Contractor shall supply the 7 full-size sets and two sets of the electronic file of the As-Built Drawings and the 5 sets of hard copies and two sets of the electronic file the As-Built Records.

- 6.13.3. During the Defect Notification Period, if the Works would be modified due to the failure of the Contractor, the updated As-Built Drawings and Records shall be re-submitted at the end of the Defect Notification Period.

6.14. Post-Acceptance Changes

- 6.14.1. The changes to accepted drawings, whether they are initiated by the Contractor or the Engineer, shall be submitted through the procedure prescribed in Sub Clause 6.10 above. Upon acceptance of the post-acceptance change, the Engineer shall issue a DCC to this effect. Submission as a result of a post-acceptance change shall use a new DRCA number, i.e., not a previously used one.
- 6.14.2. The Contractor may propose an alternative procedure for implementing post-acceptance changes (hardware and software) for review of the Engineer.
- 6.14.3. For requesting any change to the accepted design, the Contractor shall submit the relevant design details for review of the Engineer. The Contractor shall not implement any change without receiving Approval from the Engineer.

6.15. Approval of Manufacturers and Suppliers

- 6.15.1. Details of all the proposed materials, assembly and component suppliers, manufacturers, and sub-contractors shall be submitted for Engineer’s Approval.
- 6.15.2. The Contractor shall demonstrate in the submissions for supplier/manufacturer approval that all the proposed suppliers/manufacturers have successfully manufactured the same or similar items before for previous projects.
- 6.15.3. Information to be submitted for manufacturers and supplier’s approval shall, as a minimum, be:
 - (1) name of Supplier;
 - (2) previous experience of supplying similar materials, component, assembly, or service;
 - (3) list of similar items supplied, or services rendered;
 - (4) for materials, components, and assemblies the internal testing facilities at the Supplier/manufacturer’s works; and
 - (5) Supplier/manufacturer’s quality procedures, organization, and certification.
- 6.15.4. The Contractor shall obtain Approval for the materials, assemblies, and components and their supplier/manufacturer or sub-contractor prior to confirming any order with a supplier, manufacturer, or sub-contractor. Supplier familiarization and quality inspections shall be undertaken as stated in Clause 4.5.11.

6.16. Material Control Schedule

- 6.16.1. The Contractor shall produce and submit for Approval a Material Control Schedule (MCS). The format of MCS shall be given a Notice of No Objection by the Engineer and shall contain the following minimum information:
 - (1) Materials, assembly or component description;
 - (2) Name, supplier/manufacturer;
 - (3) Country of supply/manufacturer;
 - (4) Drawing number, status, etc;

- (5) Purchase order number/reference;
- (6) Quantity;
- (7) Approval status;
- (8) Planned and actual production start date(s);
- (9) Planned and actual finish date (s);
- (10) Planned and actual date or release for shipment;
- (11) Planned and actual arrival on Site;
- (12) Date and quantity required on-site;
- (13) Mode of transportation;
- (14) Comments/actions; and
- (15) Planned and actual installation requirements.

6.16.2. The MCS shall be updated and maintained as a live document.

6.16.3. Where the MCS shows a delay from the planned dates, the contractor shall provide for Approval details of the measures that will be undertaken to recover any delay experience.

6.17. Method Statements

6.17.1. The Contractor shall submit for the approval Method Statements and an Inspection and Testing Plans addressing all construction/installation procedures, safety, and health requirements, environmental control measure, and quality control procedures for each task not less than fifty-six (56) days prior to the start of the related construction/installation activities.

6.17.2. The Method Statement, material submissions, and Inspection and Testing Plan shall have received Approval prior to the contractor commencing any work on the task described.

6.17.3. Method Statements originating from sub-contractors shall have been reviewed and approved by the contractor prior to the submission.

6.17.4. Before the commencement of work, specific Method Statement training shall be provided to the supervisors and workers involved in the work, on the agreed safe work method and safety precautions to be implemented.

6.17.5. The Contractor shall provide to each of their site representative(s) involved with the works approved Method Statement(s), Inspection and Testing Plan(s), and other related document(s).

7. DOCUMENT AND DRAWING SUBMITTALS AND REVIEW

7.1. General

The Contractor shall transmit all submissions to the Engineer according to the procedure laid down in the following paragraphs. The general requirements are as follows:

The Contractor shall provide a non - web-based system of transmittal for formal project correspondence, documents, drawings, and information and ensure efficient information

management on the Project. The Contractor shall provide the Project-wide use of the system during the Design and Construction Phases and also the Defects Notification Periods.

7.2. Project Document Control Procedure

Within twenty-eight (28) days after Commencement Date, the Contractor shall submit a Project Document Control Procedure to the Engineer for review, which shall include but not be limited to the following:

- (1) a document approval system which shall specify the level of authority for approval of all documents and material before submission to the Engineer,
- (2) a system of issuing documents to ensure that pertinent documents are issued to all appropriate locations,
- (3) a document change or re-issue system to ensure that only the latest revision of a document can be used, and
- (4) a submission identification system that identifies each submission uniquely by the following:

Contract number, Discipline, Submission number; and Revision indicator.

7.3. Document Submissions

- 7.3.1. The Contractor shall submit a Drawing Register to the Engineer in electronic copy and hard copy with each submission of drawings and at an interval agreed by the Engineer. The drawing register shall be in a format submitted for review and given a Notice of No Objection by the Engineer and shall include each document reference number, version, date, title, and data-file name.

7.4. Submission and Response Procedure

7.4.1. General

Where submissions related to the Works are required, except where specific procedures are given for certain items, all submissions shall be submitted and reviewed according to the procedure laid down in the following clauses.

7.4.2. Proposal

Each submission shall be accompanied by a brief introduction to explain which equipment, part, or section of the Contract Works to which the submission refers, listing the documents enclosed with the submission, and describing in outline how all relevant requirements of the Works Requirements are achieved by the proposals.

7.4.3. Submission Response Request

For each submittal, the Contractor shall prepare a Submission Response Request (SRR) carrying the date of submission, the submission reference number, the submission title, and the authorized signature of the Contractor’s responsible engineer to confirm that, in the opinion of the Contractor, the submission:

- (1) complies with all relevant requirements of the Works Requirements,
- (2) conforms to all interface requirements,

- (3) contains, or is based on auditable and proven or verified calculations or design criteria,
- (4) has been properly reviewed by the Contractor, according to the Contractor’s Quality Assurance System, to confirm its completeness, accuracy, adequacy, and validity,
- (5) has taken account of all requirements for approval by statutory bodies or similar organizations, and that where required, such approvals have been granted, and
- (6) contains 2 (two) properly signed copies of the Design Certificate (Form DC),
- (7) Each design submission shall be accompanied by a design statement and compliance matrix which describes the scope and content of each submission, its underlying assumptions, and non-conformances.

7.4.4. Reports and Records

- (1) The Contractor shall submit reports and records to the Engineer in a format and periodicity agreed by the Engineer. Reports and records shall be signed prior to submission by the Contractor’s agent or by a representative authorized by the Contractor.
- (2) The Contractor shall submit the documents as required by the Engineer as Project records in full and on time. The Engineer shall determine the adequacy of the Project record.
- (3) The Contractor shall establish and maintain a place for the storage and archiving of all the documents relating to the Contract Works but not required to be submitted to the Engineer.
- (4) Project records will eventually be used by the Employer to manage, operate, and maintain the Contract Works after the completion of the Project under construction and for future reference.
- (5) The Contractor shall also submit the Interface Register with the status of the Interface progress along with the Monthly Progress report in the format as agreed by the Engineer with a 3 months extract showing those interface activities achieved during the previous month and those projected for the 2 months period ahead with details of any interfaces currently in progress and any that have been missed with mitigation proposals.

8. MANUALS AND DOCUMENTS

8.1. Manuals and Documents for Equipment and Systems

The Contractor shall produce manuals and documents for all the equipment and systems supplied in Railway System works. These shall include, but may not necessarily be limited to, the following:

- (1) System Documents - a comprehensive description of all system principles at block diagram level,
- (2) Operating/User Manuals - broken into as many sub-sections as may be necessary and providing sufficient information to enable non-technical staff to fully exploit the facilities of each system,

- (3) Workshop Documents - installation and circuit descriptions, full schematics, circuits, wiring diagrams, mechanical construction drawings, and itemized parts list to enable all maintenance rectification and setting-up to be carried out,
- (4) Software System Documents - for each software package and each piece of equipment which incorporates programmable devices and for which bespoke software has been prepared specifically for this application, source code listings with comprehensive comments shall be provided for all bespoke software together with configuration listings for all configured standard software packages,
- (5) Equipment Room Documents - all wiring diagrams and circuits, equipment layout, terminal and cable listing, and including such external equipment as may be necessary for completeness.
- (6) Maintenance and Servicing Manuals - to specify requirements, procedures, and service intervals for planned preventative maintenance and in addition to convey sufficient information on equipment principles and practice to enable first line fault diagnosis and rectification by technician staff.

8.2. Operation Manuals

8.2.1. The Contractor shall provide Operation manuals explaining the purpose and operation of the complete system together with its component subsidiary systems and individual item of equipment. The characteristics, ratings, and any necessary operating limits of the equipment shall be provided.

8.2.2. Content Structure

The Contractor shall arrange all documentation in accordance with the following guidelines for all Operation manuals:

- (1) The first section shall be an overview of the functions provided by the systems.
- (2) All functions shall be described, and all operator input clearly defined.
- (3) All system operating sequences shall be explained.
- (4) All indications and alarms shall be described together with the appropriate operator response.
- (5) Descriptions of indications and operator inputs shall be accompanied by pictures or screenshots of the control interface.
- (6) Lengthy technical descriptions of the systems in sections on operator input shall be avoided and if required shall be segregated into an appendix for reference.
- (7) Relevant system block diagrams, drawings, flow charts, etc. shall be provided where these assists understanding of the text and the significance of the equipment alarms and status indications.

8.3. Maintenance Manuals

8.3.1. The Maintenance Manuals shall provide detailed instructions for the Railway Systems. These manuals shall be produced with due regard to the qualification of personnel who shall be required to refer to them. These documents will be issued as controlled documents and should therefore be collated and numbered in proper order corresponding to the contents and index pages. Nomenclature of equipment, diagrams, and figure numbers or units shall be consistent throughout the text. In order to comprehend the text, diagrams,

drawings, sketches, and actual photographs shall be added where necessary. All manufacturers’ literature identification codes or stamp markings shall be omitted. Precautions and warnings regarding the safety of life and equipment shall be included where applicable. Manuals shall be clearly identified as being:

- (1) Preventive maintenance,
- (2) Recovery/corrective maintenance, and
- (3) Software maintenance.

8.3.2. The Contractor shall arrange all documentation in accordance with the following guidelines for all Maintenance manuals:

- (1) The first section shall be an overview of the functions provided by the systems.
- (2) All functions shall be described, and all operator input clearly defined.
- (3) All system operating sequences shall be explained.
- (4) All indications and alarms shall be described together with the appropriate operator response.
- (5) Descriptions of indications and operator inputs shall be accompanied by pictures or screenshots of the control interface.
- (6) Lengthy technical descriptions of the systems in sections on operator input shall be avoided and if required shall be segregated into an appendix for reference.
- (7) Relevant system block diagrams, drawings, flow charts, etc. shall be provided where these assists understanding of the text and the significance of the equipment alarms and status indications.

8.4. Electronic Manuals

- 8.4.1. The Contractor shall provide manuals in the electronic format. This is in addition to the submission of manuals in hard copies.
- 8.4.2. The format of the electronic copies shall be proven in at least two other applications and shall allow for links between parts catalogue and maintenance instructions.
- 8.4.3. The Document Management System and language used shall be subject to the Engineer’s review.

8.5. Operating/User Manuals and Maintenance and Servicing Manuals

Operating/User Manuals and Maintenance and Servicing Manuals shall be divided into indexed sections explaining the subject matter in logical steps. Most manuals shall consist of A4-size printed sheets bound in stiff-cover wear-resistant binders clearly and uniformly marked with the subject matter and reference number. Where alternative sizes are proposed, (e.g. A5/A6 pocketbooks of schematic wiring diagrams) these shall be for review and acceptance. The binding shall allow for all subsequent changes and additions to be readily affected.

Information shall be provided in pictorial form wherever and whenever possible and shall include step-by-step instructions and views of the particular equipment including exploded views.

The Contractor shall provide clarifications and amendments to the manuals as necessary

during the execution of the Contract. Updates shall be provided for the originals and all copies.

8.6. Submission of Manuals and Documents

The Contractor shall submit at least (a) System Documents, (d) Software System Documents, and (e) Equipment Room Documents in Sub-Clause 8.1 for review by the Engineer prior to Factory Acceptance Tests. All the other documents shall be submitted by the Contractor before the installation construction starts.

The Operating/User Manuals, the Maintenance and Servicing Manuals, and other technical manuals and documents shall be prepared in English and Tagalog.

All the manuals and documents shall be reviewed and given a Notice of No Objection by the Engineer.

8.7. Number of Submission Copies

The Contractor shall provide six (6) copies of all manuals and documents (and one CD) for the use of the Engineer and the Employer.

9. MANPOWER AND WORKFORCE

9.1. Local and Overseas Filipino Worker (OFW)

For onshore works in the Philippines, the Contractor is encouraged and highly recommended to accommodate and give priority to local and Overseas Filipino Workers (OFW) displaced by COVID-19, and workers availing the Balik Probinsya Bagong Pag-asa program should not be less than 10% of their workforce, unless no such workers are available for the project as certified by the Department of Labor and Employment (DOLE) Regional / Provincial / Field Offices.

9.2. Engagement of Staff and Labor

The Contractor shall take pro-active measures to encourage the employment of women and PWDs with the aim to achieve at least 20% women and 5% PWDs in skilled and unskilled positions in all stages of construction.

10. INSPECTION, TESTING, AND COMMISSIONING

10.1. General

10.1.1. Inspection, Testing, and Commissioning shall comply with all requirements of the GC supplemented, amplified, modified, or superseded as applicable by the PC, the ERT, and the ERG.

The Contractor shall perform all inspection, testing, and commissioning activities to satisfactorily demonstrate that when completed, the Works would be fit for the purposes for which the Works are intended as defined in the Contract.

The Contractor shall provide all necessary equipment and test instruments, special tools, emulators, simulators, and test software, to carry out the test at his cost. The use of this test equipment, tools, and others shall be subject to approval by the Engineer.

The Contractor shall carry out the FAT at the premise of designated manufactures.

The Contractor shall be responsible for providing temporary electricity supply, all instruments, gauges, test equipment, tools, accessories, personnel, services, and necessary facilities required for the execution of all tests and inspection. Wherever necessary, the Contractor shall provide two or more sets of testing equipment, tools, and others to expedite testing. All test equipment shall be accompanied with the appropriate calibration certificate by a testing authority of the equipment.

The Contractor shall submit the Inspection, Testing, and Commissioning Management Plan for the Engineer’s review as per the schedule furnished in Table 4-1 of Appendix 4 attached hereto. The purpose of the Inspection, Testing, and Commissioning Management Plan is:

- (1) To provide evidence as to how the Contractor will plan and program his tests and inspection and test activities; and
- (2) To allow the Contractor to indicate his “Witness and Quality Hold Points” for selected operations.

10.1.2. The Inspection, Testing, and Commissioning Management Plan shall be prepared in accordance with the Employer’s Requirement – ERT. This plan shall also include integrated testing and commissioning of trains in the section and service trials before introduction in revenue service. The plan shall contain, but not limited to, the following topics:

- (1) the Contractor’s methodology for inspection, testing, and commissioning;
- (2) all Inspections and Quality Hold Points;
- (3) inspection, testing, and acceptance operations performed on the parts during and after fabrication;
- (4) inspection, testing, and acceptance operations performed on sub-assemblies composed of these parts if any;
- (5) inspection or test operations performed during on-site activities;
- (6) tests, inspections, and examinations performed on systems assembled in shop and site;
- (7) the interdependency and inter-relationship with Interface Contractors and their commissioning program;
- (8) the objectives of each test and criteria for successful tests;
- (9) organization chart and Curriculum Vitae of key personnel in the testing and commissioning team; and
- (10) documentation for conducting tests and submission of testing and commissioning procedures.

- 10.1.3. The Contractor shall submit a testing and commissioning programme. This programme shall contain full details of the contents and sequences for all tests to be carried out, together the procedures, standards or limits to be achieved for each test including verification and validation. As part of the commissioning programme, a commissioning strategy report shall be agreed by the commissioning panel or other arrangements to be advised by the Engineer, and shall also be submitted by the Contractor for confirmation of acceptance of the alternative arrangements. In addition, the testing and commissioning programme shall be updated and submitted periodically to the Engineer for control and monitoring of the Contractor’s progress.
- 10.1.4. Inspection Hold Points
- (1) The Contractor shall propose a set of inspection hold points in the Inspection, Testing, and Commissioning Management Plan. The hold points shall be structured so that a formal hold point is allowed for each significant element of the Railway System item’s manufacturing process. At each hold point, the Engineer shall hold a formal inspection, or advice that the inspection has been waived.
 - (2) The manufacturer of each Railway System equipment or part thereof shall not proceed until the inspection by the Engineer has been completed or while waived.
 - (3) No equipment shall be considered ready for delivery without the Engineer’s endorsement in writing. The Contractor shall bear the cost of attendance of the inspections including travel, flight charge from Manila to the place where the inspection will be made, lodging, local transportation, safety equipment, etc., for the Employer’s and Engineer’s Personnel. If the inspection is not be completed satisfactorily, the additional inspection attended by the Employer’s and Engineer’s Personnel will be arranged and the cost of attendance for such additional inspection shall be borne by the Contractor.
 - (4) Once the Inspection and any required remedial actions are completed to the satisfaction of the Engineer, he shall give consent for Railway System equipment’ shipment and/or dispatch.
- 10.1.5. The Contractor or his subcontractor is responsible for the execution and recording of all inspections and tests which are to be found on the Inspection, Testing, and Commissioning Management Plan. All the technical conditions of the material manufacturing and testing have to be included in the material and part acceptance certificates.
- 10.1.6. For manufacturing and on-site activity surveillance, the Contractor will develop and implement a test and commissioning plan, which includes acceptance tests.
- 10.1.7. The Engineer will then check the plans to see whether it meets the requirements or not. The Engineer shall inform the Contractor in writing within a reasonable period after receipt of the following information;
- (1) that the Contractor's proposed methods of inspection, testing, and commissioning (including Integrated Testing and Commissioning) have the consent of the Engineer;
 - (2) in what respects, in the opinion of the Engineer about the Contractor's proposed methods, etc.;
 - (3) fail to comply with the Employer's Requirements and/or the Final Design Document;
 - (4) would be detrimental to the Works and/or to the other works comprising the Project;

- (5) do not comply with the other requirements of the Contract; or
 - (6) as to the further documents or information which is required to enable the Engineer to properly assess the proposed methods of inspections etc.
- 10.1.8. In the event that the Engineer does not give his consent, the Contractor shall take such steps or make such changes in the said methods or supply such further documents or information as may be necessary to meet the Engineer's requirements and to obtain his consent. The Contractor shall not change the methods of inspection, testing, and commissioning (including Integrated Testing and Commissioning) which have received the Engineer's consent without further review and consent in writing of the Engineer.
- 10.1.9. Notwithstanding the foregoing provisions of this Chapter, or that certain of the Contractor's proposed methods of inspection, etc. may be the subject of the consent of the Engineer, the Contractor shall not be relieved of any liability or obligation under the Contract.
- 10.1.10. The Engineer shall have the facility to monitor all tests and have access to all test records. Ample time shall be allowed within the testing program for necessary alterations to equipment, systems, and designs to be undertaken, together with re-testing prior to final commissioning.
- 10.1.11. Unless agreed in writing by the Engineer, personnel engaged in testing shall be independent of those directly engaged in the design or installation of that equipment however, subject to the approval of the Engineer the system designer could be engaged in the design qualification tests such as type tests and first article inspections.
- 10.1.12. All test equipment shall carry an appropriate and valid calibration label and / or certificate.
- 10.1.13. For each of the identified tests, the Contractor shall produce a test report, in three copies, and an approved format, within an agreed period following the test, for acceptance by the Engineer. The Contractor shall sign all reports of tests. The Engineer reserves the right to reasonably call for additional tests if considered necessary.

10.2. Non-Conformity and Deviation Disposition

- 10.2.1. The Non-Conformity and Deviation detected/observed during manufacturing, testing and commissioning shall be grouped into essentially three types and shall be dealt with as under:
- (1) Type 1: Non-conformity not in violation of the ERT or design documents originated by the Contract and given a Notice of No Objection by the Engineer.
 - (2) Type 2: Non-conformity with the ERT or design or documents issued by the Contractor and given a Notice of No Objection by the Engineer, but which can be reconciled with the applicable specification.
 - (3) Type 3: Non-conformity with the ERT or design or documents issued by Subcontractors and given a Notice of No Objection by the Engineer which cannot be reconciled with the applicable specification. Some examples of this group of non-conformity but not limited to are:
 - Equipment, component, or system unable to meet functional or performance requirements;
 - Critical dimensions (involved in the stress analysis report of interface dimensions) out of tolerance;

- Inspection or control not carded out and is impossible to be repeated;
- Component without appropriate identification to ensure its recording.

10.2.2. These types of non-conformity shall be recorded in a Non-conformity Report (NCR) and reported by the Contractor to the Engineer for processing and disposition. The Contractor shall propose the final solution and submit to the Engineer for his Approval during a meeting before implementation.

10.3. Engineer's Stop Work Order (SWO)

10.3.1. The Engineer or his representative will have the general responsibility to verify that during manufacturing and construction the associated control or test operations performed by the Contractor is in accordance with the relevant submissions that have been given a Notice of No Objection and the requirements of the contract.

10.3.2. A stop-work order is issued when significant situations adverse to quality or safety are noted and immediate action is required.

10.3.3. The stop-work order shall be issued under the following conditions:

- (1) Equipment procured by the Contractor is not able to meet the specified quality level,
- (2) Use of non-approved drawings or documents during the manufacturing of items or equipment by the Contractor (or his Subcontractor),
- (3) Repetitive non-conformity without appropriate corrective action by the Contractor (or his Subcontractor),
- (4) The Contractor (or his Subcontractor) frequently ignores the Engineer's observations regarding inspections, or
- (5) When a significant non-compliance of the Quality Assurance Management Plan or Safety Plan is detected.

10.4. Engineer's Corrective Action Request (CAR)

10.4.1. During the course of performing audit or inspection, the Engineer may identify situations that are contrary to product quality or may lead to products of indeterminate quality, and in such a situation the Engineer shall issue a Corrective Action Request (CAR).

10.4.2. On receipt of CAR, the Contractor shall take Corrective Action and shall return the CAR to the Engineer. In this regard, the Engineer's decision shall be final.

10.5. Test Groups

10.5.1. The Contractor shall structure his testing plan based upon the following testing stages:

(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 the design conforms to all relevant technical requirements, is fit or purpose in the environmental conditions specified, as well as satisfying any additional features that may result from the needs of the RAMS process.

(2) First Article Inspection

The Inspection, Testing, and Commissioning Management Plan shall list all major sub-systems and shall identify those which the Contractor proposes to be subject to First Article Inspection (FAIs). The Engineer will advise any adjustments required and the Contractor shall prepare a visit schedule for inspection of those items as required by the Engineer.

(3) Routine Tests

Routine Tests shall be carried out on items of equipment or sub-systems to be installed in substantial numbers across the railway, or that have a bearing on the overall performance of the railway system.

(4) Factory Acceptance Tests

Factor Acceptance Tests (FATs) shall be conducted at the place of manufacture of the system and comprehensively represent the system in terms of architecture and load, to demonstrate the performance of the system and the approved final design.

(5) Post Installation Check

Post installation and prior to powering up equipment, a check shall be carried out on the installation, wiring and readiness of the sub-system to be powered.

(6) Partial Acceptance Tests

Partial Acceptance Tests (PATs) shall comprise a local test conducted on sub-system/geographic commissioning lot.

(7) Site Acceptance Tests

Site Acceptance Tests (SATs) shall comprise testing of the complete system excluding interfacing systems, i.e., with interfacing systems simulated to demonstrate end to end performance.

(8) System Integration Tests

System Integration Tests shall test the system across the whole railway system fully integrated with any interfacing systems.

(9) Performance Demonstration Tests

This phase of testing shall demonstrate the overall performance of the delivered system as a part of the railway.

11. DEFECTS LIABILITY

11.1. Remedying Defects

11.1.1. The Defect Notification Period of the Railway Systems shall be seven hundred and thirty (730) days from the date of Handover of the Railway Systems subject to any extension under the Conditions of Contract and Sub-Clause 11.1.3 below.

11.1.2. The Contractor shall be responsible for any defect or failure attributable to defective design, material or workmanship, outcome, or notified by (or on behalf of) the Employer during the Defect Notification Period. The Contractor will not be liable for damage caused because the Engineer or the Employer or any other third parties did not follow the written operation and maintenance instructions or did not use the trains in accordance

with the technical documents.

- 11.1.3. During the Defect Notification Period, if any defect, imperfection, or other faults will require any design modification to a component of equipment, the Defect Notification Period of that part shall re-start from the date when such modification of the or component of equipment is completed to the satisfaction to the Engineer and commissioned into service.

- 11.1.4. During the in-service Defects Notification Period (DNP), the Contractor shall demonstrate successful achievement of the RAM performance targets, which will be a prerequisite of the application for a Performance Certificate to be issued by the Employer.

Failure to meet the E&M Systems and Track works RAM targets within the DNP shall mean that the DNP shall be extended until such time as the RAM targets has been met.

Regardless of the above, the maximum DNP is 4 years from the date of issue of the Taking Over Certificate.

11.2. Defect Notification Period

- 11.2.1. During the Defect Notification Period, the Contractor will undertake the necessary remedial works for defect or damage due to the Contractor’s failure at his own risk and expense including spare parts and consumables, if required, and labor.

- 11.2.2. All the equipment and material necessary for testing and remedying defect or damage in connection with the Defect Notification Period will be provided by the Contractor bearing all the related expenses.

- 11.2.3. Notwithstanding that the Contractor has provided the O&M Spares in accordance with the list agreed with the Engineer, the Contractor shall be fully responsible, entirely at his own cost, for the failure of all items during the Defects Notification Period that is not in the list of O&M Spares and shall replace them as soon as reasonably possible. In the event that any item fails before the time that the Contractor has indicated in the Spare Parts Management Plan that it will need to be replaced, such failure shall be deemed to be and shall be treated as a defect.

- 11.2.4. The Contractor shall propose the plan for how he will perform his obligation for the Defect Notification Period including the set-up of the service organization, during the Defect Notification Period. The plan shall include the service organization including both in the Republic of the Philippines and abroad, communication line with the Employer and/or the Engineer, stock of spare parts for Defect Notification Period, etc. During the Defect Notification Period, the Contractor shall be responsible, free of charge, for the repair of defects/damage and replacement of components where the system does not conform to functional specification and performance requirements specified in the Employer’s Requirements. Normal wears and tears are excluded from these defects.

- 11.2.5. The repair and/ or replacement of failed components and equipment and installation of repaired/replaced components/equipment shall be undertaken by the Contractor free of charge at site. The Contractor shall bear the customs duty, freight charges, and all other expenses involved in the collection of defective components and equipment from the Site, and transportation to the manufacturer’s works in the Republic of the Philippines or abroad and its return to the Site after repairs.

- 11.2.6. All replacement and repairs under the Defect Notification Period shall be carried out by the Contractor promptly and completed to satisfaction of the Engineer, on notification of the defect by the Employer and/or the Engineer on behalf of the Employer so that no Railway System equipment is unfit for service for more than twenty-four (24) hours or another period the Engineer may agree to, which shall exclude the time taken for withdrawal/ induction of trains from/to services. The Employer or the Engineer on behalf of the Employer will notify the Contractor in writing of any defect together with a brief description thereof. Upon receipt of such notice, the Contractor shall within a reasonable period of time and at his own costs remedy this defect. If within a reasonable time, the Contractor fails to fulfill his obligations after a reasonable amount of trials for remedying the defect (at least three trials), the Engineer may fix by written notice a reasonable final time for completion of the Contractor's obligations. In case the Contractor fails to fulfill his obligations within such final time, the Employer may himself undertake the necessary remedial works or employ a third party to do so, always at the risk and expense of the Contractor.

12. SOFTWARE MANAGEMENT AND CONTROL

12.1. Prescriptive Framework

- 12.1.1. All software to be developed or modified shall follow the normative requirements of standards proposed by the Contractor. The Contractor shall define within the Software Quality Assurance Management Plan what techniques and measures are to be applied for software development.
- 12.1.2. The Plan shall require the Contractor to provide all changes, bug fixes, updates, modifications, amendments, and new versions of the programs, as required by the Engineer. The Engineer may also direct to provide a copy of the previous version of software till such time the new version of software is proven.
- 12.1.3. The Contractor shall provide all tools, laptop computers, or any special device to upload/download the software, equipment, manuals, and training necessary for the Engineer to maintain all software provided under this Contract. The documentation of software may be supplied after the expiry of the Defect Notification Period under the terms and conditions to be mutually agreed at the time of the contract negotiation.
- 12.1.4. When a fault is discovered in delivered software or an error in the associated documentation, the Contractor shall take the necessary steps to rectify such faults and errors at the earliest opportunity. The Contractor shall supply to the Engineer, full details, in writing, as to the nature of the corrective action proposed or taken. These changes shall be documented in the form of a Software Engineering Change Proposal (SECP), which shall be given a Notice of No Objection from the Engineer. The documentation of software may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed at the time of the contract negotiation.
- 12.1.5. It will be incumbent upon the Contractor to take responsibility for any changes required to the software.
- 12.1.6. It shall provide a cybersecurity framework for the identification and protection of Critical Cyber Assets to support reliable operation of the system, and to protect these assets from cyber-attacks.

12.2. Software Framework

- 12.2.1. All the software produced or supplied for the Project shall be subject to a defined quality framework. The Contractor shall use a Quality Assurance System which is compliant with ISO 9000 series and others and meet the requirements as stipulated in the ERT. ISO 9000-3 is considered appropriate for low criticality software (safety integrity level 0 or 1). The quality framework requirements for safety integrity level 2 and above are supplementary to the requirements of IEC62279 or EN 50128.

12.3. Software Management Control

- 12.3.1. The Contractor shall assign the Software Manager and/ or Software Quality Manager, where software development or modifications are required, under the Contract.

12.4. Auditing

- 12.4.1. The Engineer may carry out an audit of the software. Further external independent audits may also be arranged at the Engineer discretion. The Contractor shall allow the ISA to view the software documentation as deemed required without any hindrance.
- 12.4.2. The Contractor shall conduct audits through an assigned internal software auditor to ensure the process is compliant with ISO 9001, ISO 12207, and EN 50128 or equivalent standards.

12.5. Software Acceptance

- 12.5.1. The Contractor shall also submit an Operational Safety Report (Software) (OSR(S)) for software acceptance by the Engineer.
- 12.5.2. The Operational Safety Report (Software) shall include, as a minimum
- (1) OSR(S) – Introduction.
Shall describe the nature of software sufficiently to ensure that the Engineer is given a comprehensive overview of primary characteristics such as structure, functions, criticality, volume, and language.
 - (2) OSR(S) - Evidence of Quality Management.
Shall provide evidence to demonstrate that the software development has been subject to acceptable quality assurance.
 - (3) OSR(S) - Evidence of Safety Management.
Shall provide evidence to demonstrate that the software development has been subject to acceptable safety management.
 - (4) OSR(S) - Technical Report.
Shall describe how software integrity has been achieved.
 - (5) OSR(S) - Operation and Maintenance Report.
Shall describe the software operation and maintenance characteristics.
 - (6) OSR(S) - Restrictions for Use.
Shall define what restrictions are applied to the use of the software.

- 12.5.3. The sub-systems and associated software-based systems should be accepted as a whole system. Both the embedded and application software shall have different version references for acceptance.

12.6. Availability of Source Code and Development Tools

- 12.6.1. With the exception of Commercial off-the-shelf (COTS) software, the Engineer shall be provided with access to the software documentation including source code listings and development tool details; unless it is tagged as an intellectual property. This would help the Employer for the application and maintenance of that COTS software and can make minor changes when the railway configuration changes. The documentation of software may be supplied after the expiry of the warranty period, under the terms and conditions to be mutually agreed upon during the contract negotiations. Balance source code with all relevant documentation shall be kept by the contractor in an Escrow account. The initial three years lease of the Escrow account shall be paid by the contractor.
- 12.6.2. Complete documentation of non-intellectual property software to be supplied by the Contractor, as above, which enables the Employer to debug and implement the parameter of the system, if considered necessary. The Employer’s engineers shall be fully trained and made conversant with the software and other related issues as found necessary during the Contract execution to enable the Employer to operate, maintain, repairing the system efficiently.
- 12.6.3. After loading and the satisfactory functioning of the software, the Contractor shall supply two back-up copies of the software, including any new versions adopted along with their installation procedure. The documentation of software along with training material may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed during the contract negotiations.

12.7. Re-Use of Existing Software

- 12.7.1. Where existing software (defined to module-level) is to be re-used without modification, the Contractor shall provide acceptable evidence to the Engineer as to why that software is suitable for use in the proposed application. This evidence may be historical (certified evidence of previous satisfactory use in a similar environment and application), or it may be sought as cross acceptance from another railway authority or statutory body. Software re-use shall not be acceptable, without a detailed review, where the proposed application is of the same or lower safety integrity level (SIL) than the current application.

12.8. Test Software

- 12.8.1. All test software, with the exclusion of built-in test software, shall be produced in accordance with a quality system controlled under the requirements of accepted international standards. Test software shall be developed and documented using structured techniques and shall be designed to be maintainable throughout the duration of the Contract. All test software shall be documented to be supportive of maintenance. Any test software, which is to be delivered to the Engineer (for long-term testing use), shall be fully documented including source code listings to allow the Engineer to maintain the software for the life of the supported system.

12.9. Software Rights

- 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. The documentation of software may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed during the contract negotiations. The Contractor shall indemnify the Employer/the Engineer, its heir, or licensees against the claim of any party, subcontractor for the unauthorized possession, or use of the software supplied.
- 12.9.2. The Contractor shall provide and hand-over any software or codes developed specifically for, and during this project.

13. SUPPLY OF SPARE PARTS, SPECIAL TOOLS, AND TEST EQUIPMENT

13.1. Details of supply

- 13.1.1. The Contractor shall provide spare parts, tools and test equipment for the maintenance of all Systems included in the Contract, in accordance with the provisions of this Section, as part of the Works:
- (1) Spare parts including (but not limited to) sub-assemblies and those to be supplied by its sub-contractors of any tier ("Spare Parts");
 - (2) Special tools, jigs, fixtures and gauges and test, and maintenance equipment, including those to be supplied by its subcontractors of any tier ("Special Tools and Test Equipment"),
- 13.1.2. The recommended list of O&M spares and Capital spares shall be updated for the review by the Employer at the time of completion of the Technical Design and again at the time of Construction/Installation Design with the identity of parts by source, OEM part number, and individual price. A final update with the same details shall be made one year before the completion of the works. O&M Spare parts shall be delivered to the Employer no later than six (6) months before the completion of Works.
- 13.1.3. The information supplied in respect of each spare parts, special tool, and test equipment shall include, but shall not be limited to, the following:
- (1) Core data - main assembly/equipment
 - 1) manufacturer/brand name
 - 2) manufacturer's type/model number
 - 3) rating
 - 4) serial number if applicable
 - 5) total number of the main assembly/equipment supplied under the contract
 - (2) Core data - sub-assembly of main assembly/equipment
 - 1) manufacturer/brand name
 - 2) manufacturer's type/model number
 - 3) rating
 - 4) serial number, if applicable
 - 5) total number of sub-assemblies in the main assembly/equipment supplied under the Contract

- (3) Individual item of main/sub assembly/equipment
 - 1) manufacturer order number
 - 2) parts description - a full description of the Spare Part, including a note as to whether it is a sealed unit or whether it is an assembly or sub-assembly which can be broken down into component/parts
 - 3) manufacturer/brand name
 - 4) the manufacturer's part number (if different from the ordering number)
 - 5) the subcontractor's ordering part number/reference, if applicable
 - 6) recommended quantity
 - 7) unit of measurement
 - 8) unit price CIF to Manila including delivery to designated location
 - 9) total number of the Spare Parts in the sub-assembly of the main assembly/equipment supplied under the Contract
 - 10) total number of the Spare Parts in all the sub-assemblies of all the main assemblies/ different equipment supplied under the Contract
The Contractor shall ensure that the ordering part numbers specified shall enable the Employer to procure the exact item in the future without reference to the Contractor.
- (4) Primary data
 - 1) parts catalogue number/cross-reference (illustrated parts catalogues to be submitted together with the spares schedules to the Employer.
 - 2) drawing number
- (5) Secondary data
 - 1) lead times stating whether forex-stock or for product manufactured upon receipt of order.
 - 2) delivery schedule(s).
 - 3) supplementary information:
 - special handling instruction, e.g., for fragile materials, hazardous substances, radioactive materials, etc.
 - storage requirements, e.g., overall dimensions including special packing (if any) for bulky materials, materials with limited shelf life, climate-controlled conditions, etc.
 - statutory requirements, e.g., licenses, test certificates, etc.
 - interchangeability information
 - tailor-made product for the Contract or a standard bought-in product
 - the source of the Spare Part or Special Tool and Test Equipment, including the manufacturer's name and address together with that of his agent in the Philippines and local sources
 - supplementary sheets to be used for detailed information that is important to the Employer's future procurement.

13.2. Manufacture and delivery of Spare Parts

- 13.2.1. The Spare Parts to be delivered by the Contractor shall be manufactured at the same time as the Permanent Works are being constructed/installed. They shall be manufactured, works tested, and inspected in accordance with the relevant quality system, suitably packed and labeled, and delivered to the Employer by the Contractor. Before any spares are delivered to the Employer, the Contractor shall submit to the Employer's a shipment

advice notifying details such as date of dispatch, date of arrival, vessel name, etc. as well as a packing list to indicate the contract number, variation order number, the lot size, quantity, and weight.

- 13.2.2. All spares shall be fully interchangeable with their corresponding part and configured to the latest revision during the Defects Liability Period. For spares such as electronic components, lamps, fuses, and high-use items, the Contractor shall ensure that a minimum of two alternative sources of supply are available.
- 13.2.3. If any item is due to become unavailable after the end of the Defects Notification Period, or where support of an item before the end of the design life of the Works will become unavailable, or if the Contractor subsequently ceases trading, the Contractor undertakes to transfer the relevant intellectual property rights, design rights, and technology to the Employer, following which the Employer shall have full rights to the manufacturing drawings, schedules, software and any other information needed to manufacture the relevant item. Such rights shall give the Employer complete freedom to manufacture the items in the Philippines or anywhere else in the world. The Contractor shall also undertake to notify the Employer two years in advance of the intended cessation of spares availability of any item.
- 13.2.4. If any Spare Part is rendered obsolete by a design change or material change during the design life of the Works supplied under the Contract, the Contractor shall design a replacement item to match the identical mechanical and electrical interfaces as the former item.
- 13.2.5. If, as a result of changes in technology, any Spare Part is not completely interchangeable with the original item, or the performance of any Spare Part is different from the original item, then the Contractor shall purchase the same from the Employer, at a price agreed between the parties, such quantities of the obsolete Spare Part as the Employer may possess.

13.3. Testing and Commissioning Spares

- 13.3.1. In addition to the O&M Spares, the Contractor shall keep on the Site throughout the installation, erection, and commissioning periods, sufficient stocks of Spare Parts to enable immediate replacement of any item in the Permanent Works found to be defective or in any way in non-conformance with the Specification during the installation, erection and commissioning period ("Testing and Commissioning Spares").
- 13.3.2. The Contractor shall supply and deliver the Testing and Commissioning Spares on or before the commencement of any Partial Acceptance Tests (PAT) or as defined in the ERT.
- 13.3.3. The Contractor shall submit to the Employer's for review a list of all Testing and Commissioning Spares that shall be made available during the installation, erection, and commissioning period.
- 13.3.4. The Contractor shall not be entitled to use any of the O&M Spares and/or Capital Spares (if any) to replace any item in the Permanent Works during the installation, erection, and commissioning periods.

13.4. O&M Spares

- 13.4.1. The quantities of recommended Spare Parts to be supplied by the Contractor to the

Employer shall be included in the Spare Parts Management Plan.

- 13.4.2. Notwithstanding the quantities defined in the Spare Parts Management Plan, the quantities of O&M Spares shall be sufficient for the full operation of the Works for a period of four (4) years after the Employer’s Taking Over of the Works ("O&M Spares").
- 13.4.3. At the end of the Defects Notification Period, the stock of O&M spares shall be replenished and handed to the Employer to cover a further period of two (2) years of operation and maintenance.
- 13.4.4. The Contractor shall supply and deliver the O&M Spares no later than six (6) months before the completion of a System, a Section, or the Works.
- 13.4.5. The Contractor shall submit the spares schedules for the O&M Spares in hard copies (including the illustrated parts catalogues) as well as soft copies to the Employer for review.
- 13.4.6. All spares quantities shall be rounded up to the nearest deliverable unit e.g., cable shall be delivered in complete drums, liquids in complete sealed containers, small parts in complete packs.

13.5. Special Tools and Test Equipment

- 13.5.1. The Contractor shall supply tools, special tools, and test equipment for maintenance needs for all equipment and systems provided under the Contract. Tools, special tools and test equipment shall be provided for scheduled and unscheduled maintenance, including inspections, servicing, preventive maintenance, corrective maintenance, overhaul, and testing.
- 13.5.2. The Tools, Special Tools and Test Equipment (together with the relevant calibration certificates) required to carry out all the functions described in the Operation and Maintenance Manual or as required by the Technical Requirement (ERT) shall be suitably packed and labeled, consigned to the Employer by the Contractor and delivered to the Employer in accordance with the Employer’s instructions not later than the date scheduled for stage commissioning. The extent of supply shall include protective carrying cases as may be appropriate for the storage and use of each item.
- 13.5.3. All Special Tools and Test Equipment shall be supplied with Operation and Maintenance Manuals, complete diagrams, schematics, assembly and connection drawings, calibration instructions, and circuit diagrams/descriptions for future maintenance.
- 13.5.4. Where the Contractor has used the Special Tools and Test Equipment for installation and commissioning of the Permanent Works, he shall refurbish and re-calibrate each item to the satisfaction of the Employer prior to handover to the Employer, accompanied by the Certificate of Calibration traceable to a recognized Japanese or Philippine National Standard or other appropriate Standard previously reviewed and given a Notice of No Objection by the Engineer.
- 13.5.5. Where any item of Special Tools and Test Equipment is provided by the Contractor, it shall be accompanied by drawings, manuals, and full operating instructions to enable them to be used by suitably skilled (but not necessarily specially trained) personnel in a non-hazardous manner and to achieve the desired result in terms of accuracy and quality.
- 13.5.6. The Contractor shall provide the means and instructions which describe the parameters

of each item of Special Tools and Test Equipment that are critical to their proper methods of use and which enable the Employer's staff using the Special Tools and Test Equipment to achieve the proper performance and operation. Such means and instructions shall include, but not be limited to, any routine checking, or recalibration needs for the Special Tool and Test Equipment itself.

13.6. Coding and Tagging of all Equipment, Spare Parts and Special Tools and Test Equipment

- 13.6.1. All Equipment, Spare Parts, Special Tools, and Test Equipment to be delivered to the Employer shall each carry a tag suitably marked, bar-coded (as directed by the Engineer), and numbered to sustain harsh environments.
- 13.6.2. Each individual item of equipment shall be fitted with permanent identifications label in accordance the with the coding and numbering convention and requirement developed by the CMMS for all E&M components, parts, and equipment.
- 13.6.3. In this respect the term “individual item of equipment” shall refer to a complete assembly of components and to each removable submodule within the complete assembly.
- 13.6.4. The identification label shall be permanently attached in such a way that it shall not become detached or illegible during the lifetime of the system from any cause including wear and tear, environmental effects (such as rain, direct sunlight, etc.) or any other influence. Preference shall be given to embossed or engraved metallic labels mechanically fastened by riveting or similar means to the item to which they refer.
- 13.6.5. All labels shall be easily cleaned to remove dirt and debris (including grease and oil) without disturbing the legibility properties.

14. PACKAGING, SHIPPING, AND DELIVERY

14.1. General

- 14.1.1. The Contractor shall be fully responsible for the provision and maintenance of acceptable storage facilities for the Plant and any materials or equipment he intends to use for carrying out of the Works or for incorporating into the Works.
- 14.1.2. The Contractor shall prepare, protect and store, in a manner to be accepted by the Engineer, all equipment and materials so as to safeguard them against loss or damage from repeated handling, from climatic influences, and all other hazards arising during transport, shipment, or storage on or off the site. Secured and covered storage shall be provided for all equipment and materials other than those accepted by the Engineer as suitable for open storage.
- 14.1.3. The Contractor must write the following items on all packages, but not limited to them.
 - (1) Name of packing content
 - (2) Quantity of packing content
 - (3) Size and weight of package
 - (4) Precautions of package handling
 - (5) Packing number or contract number

- 14.1.4. The Contractor must prepare a packing list and check it at the time of both shipment and delivery.
- 14.1.5. When the Contractor delivers a package from a temporary site to an actual use site, the Contractor must deliver it carefully by grasping its packing contents and observe strict precautions of package handling.

14.2. Crating

- 14.2.1. The Contractor shall provide all packing, crates, and marking. The consignments for shipment shall be packed and marked in accordance with the Engineer’s instructions. In doing so, it shall comply with the following requirements;
 - (1) Each case, crate, or package shall be waterproof, rot-proof, and insect/rodent-proof, of robust construction, and suitable for the intended purpose. The Contractor shall, in determining the packing materials to be used, take cognizance of the climatic conditions likely to occur during the period of transport, shipment, and storage.
 - (2) Each case, crate, or package shall be legibly and indelibly marked in large letters with the site address, Contract number, “right way up”, opening points, and other markings as necessary to permit materials to be readily identified and handled during transit and when received at the Site.
 - (3) Each case, crate, or package shall contain a comprehensive packing list showing the number, mark, size, weight, and contents together with any relevant drawings. A second copy of the packing list shall be enclosed in a watertight enclosure on the outside of each case or package. The distribution of additional copies of each packing list shall be in accordance with the Engineer’s instruction.
 - (4) All items heavier than 100 kg shall be marked on the outside of the case to show the gross and net weights, the points for slinging, and where the weight is bearing.
 - (5) Care shall be taken to prevent movement of items within cases, crates, or packages by the provision of bracing, straps, and securing bolts as necessary. Bags of loose items shall be packed in cases and shall be clearly identified by well-secured metal labels on which the quantity and name of the part and its index or catalogue number have been stamped.
 - (6) Plug connected electronic circuit boards shall be removed from their racks, packed, and shipped separately.
 - (7) All packing shall be free from sharp edges to prevent injury to persons or other objects.
 - (8) Each bulky/heavy case, crate, or package shall include wedge(s) for easy loading and unloading by mechanical handling equipment such as a forklift truck.
 - (9) Electronic circuit boards, integrated circuits (IC), and the like shall be well protected by using appropriate packing, e.g., anti-static bubble bag or similar.
 - (10) Rubber products and the like shall be suitably packed to avoid damage including but not limited to hardening, deformation, and peel-off.

14.3. General Precautions

- 14.3.1. Spare parts shall be tropicalized in their packing for prolonged storage in accordance with appropriate international standards and shall be suitably and individually labeled to indicate:

- (1) shelf life and date of manufacture;
- (2) type or condition(s) of storage and special handling information;
- (3) description of item and relevant part number;
- (4) serial number, if applicable;
- (5) inspection/test certificate number and batch number; and
- (6) Contract number, variation order number, and item number.

14.3.2. Tubes, cable, and conductor ends, and other similar openings shall be properly sealed and blanked off to prevent ingress of dirt or moisture. Flanged ends shall be protected by adhesive tape or jointing material covered by a properly secured wooden blank not smaller than the flange itself. Plain tube ends shall be closed off with bungs or plugs or suitable materials firmly fixed in position.

14.3.3. Particular care shall be taken to prevent mechanical transport-related damage or corrosion of shafts and journals where they rest on timber or other supports which may contain moisture. At such points, wrappings impregnated with anti-rusting composition and of sufficient strength to resist chafing under the pressures and movements during transit shall be used.

14.3.4. Spare ball and roller bearings and similarly protected items shall not be removed from the manufacturer’s wrappings or packing.

14.3.5. Fragile materials shall be packed in such a way that they shall not be damaged during transit and when they are properly unpacked for quality inspection. Glass items shall be capable of being easily re-packed without removing the original wrappings or packing for long-term storage within the same packing case.

14.3.6. Appropriate precautions in accordance with the Contractor’s safety regulations, the regulations of the Employer, and statutory regulations shall be taken in respect of all hazardous, toxic, inflammable, etc. materials.

14.4. Packing Procedures

14.4.1. All required inspection/test certificates shall be supplied and packed together with individual material. All packaging materials and procedures shall be subject to review by the Engineer.

14.4.2. All empty cases, crates, or packages, whether or not returnable, shall be removed from the Site by the Contractor or stored by the Contractor in such a way that they do not interfere with the progress of the works of the Contractors.

14.5. Shipping

14.5.1. The Contractor shall notify the Engineer ten (10) days in advance of any expected shipment date and give further notification of the actual shipment date and routing when such information is subsequently established. This shall complement the inspection requirements prior to delivery as specified herein.

14.5.2. Two copies of packing lists and quality certificates shall be attached to each case or package to be shipped. One copy shall be placed inside the package and the second copy shall be enclosed in a watertight enclosure on the outside of each case or package. A copy

of packing lists and quality certificates shall be sent to the Engineer after each package of the Works, the equipment, spare parts, and other items to be shipped have been shipped.

- 14.5.3. Without prejudice to any other provisions of the Contract, and unless otherwise specifically described, the Contractor shall be responsible for all legal requirements, duties, dues, taxes, and other such requirements and expenditures required for the importation of the Works, the equipment, spare parts, and other items to be supplied under the Contract into Republic of the Philippines.
- 14.5.4. The Contractor shall clear the Works, the equipment, spare parts, and other items to be supplied under the Contract through Republic of the Philippines’ customs/ Philippine port in accordance with all Government of Republic of the Philippines’ Enactments.

14.6. Delivery

- 14.6.1. The Contractor shall deliver the materials/equipment and all items to be supplied under the Contract to the Site.
- 14.6.2. The Contractor shall unload the materials/equipment and all items to be supplied under the Contract at the designated delivery point and positioning or storing them.
- 14.6.3. Any part of the materials/equipment or any item to be supplied under the Contract that is damaged in transit shall not be considered as delivered until repairs or replacements have been made and all necessary spare parts or items have been delivered to the Site.
- 14.6.4. All documents, manuals, drawings, and other deliverables shall be delivered to an address in the Republic of the Philippines to be designated by the Engineer in writing.
- 14.6.5. The Contractor shall store and secure the Works, material/equipment, spare parts, and other items until the same has been inspected and are considered delivered at the designated point by the Engineer.
- 14.6.6. The Contractor shall remove temporary fittings required for shipment and re-assembly of equipment and shall complete this prior to the equipment or parts thereof being inspected and before they are considered delivered.
- 14.6.7. An item shall be considered delivered when all damages have been repaired and all documentation and post-delivery preparation have been completed to the satisfaction of the Engineer.

15. TRAINING

15.1. General

- 15.1.1. The Contractor shall be required to train, or arrange training for, selected members of the Employer’s Railway Operations staff in accordance with the requirements of the Railway Operator's program. These staff will include the Employer’s and the Railway Operator's Instructors who will require training in technical matters according to their intended function and in instructional techniques. An important objective of the training is to increase the ability to operate, control, supervise, and carry out maintenance work on Plant and Equipment supplied and installed by the Contractor.

15.2. Training Requirements

- 15.2.1. Contractors shall be required to provide the following four (4) types of training:
- (1) Training for Experts who will be instructors
 - (2) Training for OCC staff
 - (3) Training for station staff
 - (4) Training for technical staff including Railway Systems operation and maintenance staff
- 15.2.2. The Contractor shall provide training for OCC staff and station staff before the Trial Runs or Trial Operation.
- 15.2.3. The Contractor shall consider the methodology of the knowledge transfer. Knowledge includes not only the system itself but also matters related to the operation.

15.3. Training Periods

- 15.3.1. The Contractor shall propose appropriate man-months of training to be provided along with rates for adjustment to these requirements. The rates shall include, but not be limited to, providing instructors, training facilities, and all teaching aids, materials, and equipment necessary to fulfill the training requirements.

15.4. Language of Training Courses

- 15.4.1. All training courses will be conducted in English.

15.5. Training Instructors

- 15.5.1. The Contractor's training instructors shall be fully qualified and experienced electrical and mechanical engineers, who have a good knowledge of the English language. They will have had the experience of training engineers or technicians of the level stated on similar topics and will be fully familiar with the Plant and Equipment supplied and installed in the Works.

15.6. Contractor's obligation to obtain Approval of Instructors

- 15.6.1. Should, in the opinion of the Engineer, any of the Contractor's training instructors not be considered as competent or do not have suitable language skills, attitude or aptitude for carrying out the training courses for whatever reason, the Contractor shall remove the said person and replace him as soon as possible with an acceptable substitute.

15.7. Employer's Railway Operations Staff

- 15.7.1. Where the Employer's or the Railway Operator's staff (trainees) will be assigned to the Contractor (or his Subcontractor(s)) for the purposes of training. All such trainees must be properly supervised and monitored by the Contractor and/or Subcontractor's qualified training supervisor to ensure that each trainee has the best opportunity to benefit from the theoretical and practical experience.

15.8. Training Program

- 15.8.1. The Contractor shall develop and plan detailed training programs using training methods most appropriate to the subject matter and the level of trainee specified. Details of these

training programs shall be submitted to the Engineer not later than six (6) months from the award of Contract. The objectives, content, method, location, timing, and duration of each program as provided in the Contractor's proposals.

15.9. Training Courses

15.9.1. The Contractor's training courses shall be programmed in phase with the progress of manufacture and installation to ensure that trainees are present during all stages of the manufacture, installation, testing, commissioning, and integration testing of the Plant and Equipment that is the subject of the training program. The Contractor shall ensure that the courses fully encompass all aspects of the basic design and operation principles, manufacture, installation, testing, commissioning, and maintenance of the Plant and Equipment with maximum effort being directed at instruction in the maintenance of the installed Plant and Equipment.

15.10. All Necessary Railway Operational Instruction Aids and Material

15.10.1. The Contractor shall use all necessary teaching aids such as technical literature, manuals, photographs, drawings, films, models, and all other instructional materials as may be necessary for the training of the Railway Operator's personnel. Instructional use in the performance of Training will become the property of the Employer for the purposes of Railway Operations and Maintenance.

15.11. Plant and materials set aside for Training Purposes

15.11.1. In general, the Contractor shall use Plant and materials specifically set aside for training purposes. However, the Contractor may use, for the training of the Railway Operator's staff, subject to the agreement of the Engineer, Installed Plant and Equipment when no other such plant and materials are otherwise available. The Contractor shall not use for this purpose and spare parts or assemblies that form the O&M Spares.

15.12. Protective Clothing-Training

15.12.1. The Contractor shall provide all special or protective clothing required by the trainee; undergoing instructed training. Personal items of clothing shall be of new issue and may be retained by the trainee on completion of the training course.

15.13. Monitoring

15.13.1. Throughout the training program, the Engineer shall have free access to all training sessions to monitor the progress of the trainees and the Contractor's training instructors.

15.14. Training Practical Tests and Aptitude Reports

15.14.1. To ascertain that the objectives of the courses have been achieved the Contractor shall set periodical theoretical and practical tests for the trainees. The results of these tests together with a report on the trainees' general attitude, ability, technical knowledge, aptitude, and attendance record shall be forwarded at regular intervals to the Engineer who may also require the submission of additional reports in special cases.

15.15. Monitoring of Training Progress

15.15.1. Methods for monitoring progress shall include, but will not necessarily be limited to:

- (1) Theoretical tests and systems of assessment;
- (2) Practical test pieces and objective systems of assessment;
- (3) Progress reports.

15.16. Records of Training Progress to be Maintained

15.16.1. Records of the progress of trainees shall be kept up to date and shall be made available to the Engineer for examination when required.

15.17. Issue Test Results and progress to the Engineer

15.17.1. Copies of the records of individual trainees, showing all test results and reports of progress, shall be sent to the Engineer on completion of each training course.

15.18. Training Location and Facilities

15.18.1. The training of selected Employer’s and Railway Operator’s staff shall be carried out at such locations where the greatest benefit for trainees may be gained. This may be in the Republic of the Philippines or at places of manufacture, assembly, or testing or such other locations as may be necessary. All places of training shall be approved by the Engineer. Details of the facilities to be provided shall be included with the detailed training programs submitted by the Contractor.

15.19. Occupational Health and Safety of Trainees

15.19.1. The Contractor shall be responsible for the safety, health, and welfare of trainees when under training. Accordingly, an explanation of the safety rules and codes shall form part of a general induction course to be given by the Contractor and where considered necessary the Contractor shall issue a rulebook for which the trainee shall sign indicating his acceptance and understanding thereof. This shall include a specific COVID-19 Risk Management Plan which shall be issued with the bid and resubmitted within 28 days of Award of Contract. This resubmission shall contain modifications to reflect the changes which have occurred between the Date for Submission of the Bid and Award of Contract.

15.20. Administration

15.20.1. The Contractor shall be:

- (1) Responsible for the reception of, and hotel and travel arrangements for each trainee in regions other than Manila;
- (2) Responsible for the general welfare of trainees under its control.

16. SITE OFFICE AND SITE OFFICE MANAGEMENT

16.1. Site Restrictions

16.1.1. The particular use to which the Site is put shall be submitted to the Employer together with the Engineer for review with the following particulars:

- (1) drawings showing the layout of the Site Office for the Contractor, accommodation, access roads, and major facilities;
- (2) drawings showing the layout and the construction details of the Employer’s and Engineer’s office; and
- (3) proposals for the Employer’s and Engineer’s Site accommodation as defined by Clause 16.2 below.

16.2. Site Office Facilities

16.2.1. Employer’s and Engineer’s Site Offices

The Contractor shall provide two joint Employer’s and Engineer’s site office, one located in the MCRP section and the other in the NSRP South section.

Both offices in the MCRP and NSRP South sections shall be provided within 90days prior to the first access date for each section. The site office shall have spaces for the 40 vehicles.

The locations, layout drawings, and specifications for the offices and other facilities shall be submitted for review and approval to the Engineer 180days before the scheduled first access date or to coincide with the Contractor ‘s planning of their respective offices,

The Employer’s and Engineer’s site office shall have sufficient space for forty (40) staff excluding the office support staff (e.g., Secretary, Janitors, Administrative Personnel, IT, etc.) equipped with following facilities:

- (1) Air conditioning units. (Adequate and sized relative to the office size and number of occupants.)
- (2) Office Furnitures: 40 Desks with Drawers and chairs, (plus 10 spares for open assignment or transient office workers), 2 meeting tables, 25 portable chairs, Filing Cabinets, etc.
- (3) 2 -Meeting rooms with Noise-Reduction panels, whiteboard, and projector. (Fully equipped 1- large room for 10-12 persons, and 1 -small room for 5-6 persons).
- (4) 1- Pantry Room with Dining Facility. (Fully furnished with kitchen sink with faucet and drain system including grease trap, microwave oven, refrigerator, hot/cold water dispenser (with consumable purified water), pantry cabinet with utensils organizer, pantry cleaning materials, and consumables.
- (5) 1- Break Room. (Fully furnished with sofa, tables, chairs.)
- (6) 1- E&M Equipment and Office Storage Room. (Equipped with Lockers)
- (7) Separate Toilet and Bath Facilities for both Gender (Prefabricated Cabin Toilet, composed of water closet (Western /European type) with spray hose and flushing system, washbasin with mirror, urinal with flush valve (for male toilet), bath shower, electrical inlet connections, waterproof emergency light, exhaust fan, steps/ladder, non-skid flooring with drains, toilet & bath cleaning equipment/materials and consumables, tissue paper holder, towel holder and hooks, liquid hand soap, sanitizer

and tissue paper.

- (8) Computer network system with 5 Desktop Computers (8-Core Processor / 32GB RAM / CUDA Accelerated Graphics with 8 GB of VRAM) and Monitors (29”) and associated equipment. (Includes Telephone lines, Internet Wi-Fi, Conference Call equipment, Projector, licensed software, extension cords, etc.)
- (9) 2 no’s Photocopy machines, 2 no’s printers and its consumables.
- (10) Adequate office lighting and electrical power outlets.

The Contractor shall be responsible for the maintenance of the Employer’s and Engineer’s site office with support staff knowledgeable of administration and IT functions and provide office cleaning (Janitorial) services. The Contractor shall supply all the necessary office equipment and stationery including paper for photocopy machine, electricity, drinking water, coffee, and other office facilities supplies, and consumables need by the Employer and Engineer.

The office and parking area shall be accessed by a temporary concrete road connecting to the Public Street or Highway. A concrete pathway shall be provided on all sides of the office.

16.3. Site Management

16.3.1. The particular use to which the Site is put shall be submitted to the Engineer in form of a plan for site facilities for review within 120 days after the Commencement Date. The Contractor shall:

- (1) confine his use of the areas of the Site to purposes having been Approved by the Engineer who reserves the right to extend, amend or restrict the uses to which areas of the Site will be put;
- (2) where required under the Contract, provide and maintain fencing and lighting around and within the areas of the Site when or where necessary for the safety and convenience of the public or others or as directed;
- (3) refrain from depositing rubbish or causing nuisance or permitting nuisance to be caused and, except where reviewed and Approved by the Engineer, depositing earth on or removing earth from areas of the site;
- (4) refrain from felling trees, other than those specifically identified in the Contract to be felled, and refrain from depositing earth around the trunks of trees and protect all trees remaining on-site to the satisfaction of the Engineer;
- (5) except where otherwise provided, not permit any person to reside on the site;
- (6) not use any part of the Site or the Works for advertising purposes except with the acceptance of the Employer and Engineer.

The Site shall be maintained in a clean and tidy condition. Materials, including those required for temporary works, shall be stored in an orderly manner. The Contractor shall, throughout the period of the Contract, provide a central collection point on site for collecting all empty cans, drums, packing, and other receptacles capable of holding water. The Contractor shall ensure the regular collection and removal of such debris from the site. After every shift of works, all work areas shall be cleaned and made tidy to the satisfaction of the Engineer. The Contractor shall ensure that gases, fuels, explosives, and other dangerous goods are stored and handled in a safe manner and in accordance with

the statutory regulation pertaining to their storages and handlings. The Contractor shall be responsible for obtaining the requisite licenses at his own cost.

- 16.3.2. The Contractor shall provide all necessary protective clothing, safety equipment, hand tools, ladders, trestles, power supply, and replacement equipment for the Employer and Engineer staff engaged in Site Inspection and Maintenance (Protective clothing, safety boots, high visibility vests, safety glasses and safety field kits for 120 personnel and 20 spares). For specific activities such as working at heights, a safety harness shall be provided.
- 16.3.3. Because of the multi-disciplinary nature of the project, several different parties may require access to the same portion of the Site during the construction phase, for the installation, erection, and testing of the Works. To facilitate the organization and coordination of access and occupation requirements, the Contractor shall maintain a close liaison with other contractors.
- 16.3.4. As soon as any or all of the Contractor's installations, including offices, are no longer required for the execution of the Works, the Contractor shall with the agreement of the Engineer remove those facilities and ensure that the area is left free of debris, excess materials, and obstructions.

16.4. Services

- 16.4.1. The Contractor shall provide Electricity, Water, and Gas to the Site Office(s) as part of the Operating and Maintenance expenses.
- 16.4.2. The Contractor shall also provide the emergency electricity supply equipment at his risk and cost. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed. The Contractor shall pay, or reimburse at actual costs, the fees for the quantities consumed of such utilities, as applicable. The Contractor shall comply with all regulations of the utility companies and Government departments concerned and the rule of the Employer for usage of such utilities.
- 16.4.3. If lighting is not provided in the specific areas allocated to the Contractor, he should make his own arrangements. The Contractor shall be solely responsible for the security and housekeeping of the area, plant, and possessions allocated to him. The Contractor shall provide and maintain all facilities required by him in the area allocated for his use and all other work required to allow the Contractor to fulfill his obligations under the Contract.
- 16.4.4. The Firefighting and First-Aid equipment shall be provided in accordance with the recommendations of the Employer and Engineer. (Examples: Fire-Extinguishers, Fire-Blanket, First-Aid kits, etc.)

16.5. Accommodation

The Contractor shall provide suitable living accommodation for eight (8) staff from the Employer and eight (8) staff from the Engineer in the vicinity of the working location. The location of the accommodation shall move progressively based on the working location. The accommodation shall be provided from six (6) months prior to first site access to issuance of the final Taking Over Certificate.

17. ROAD TRAFFIC AND TRANSPORTATION

17.1. General

- 17.1.1. The Contractor shall conform to the applicable requirements under the law, act, regulations, and decision issued by the Government of the Republic of the Philippines and/or the Governmental authorities and imposed in the Republic of the Philippines. The Contractor shall ensure compliance with the requirements regarding the registration of vehicles. Vehicle size and load limitations shall be in accordance with all statutory requirements.

17.2. Transportation to Site

- 17.2.1. The Contractor shall make all arrangements and assume full responsibility for transportation to the Site of all plant, equipment, materials, and supplies needed for the proper execution of the Works. Procedures for the access to and from the Site shall be coordinated with the relevant authorities if required.
- 17.2.2. The Employer will obtain any required permits or licenses from relevant authorities for the import of the Goods intending to form or forming part of the Permanent Works or required for the sole purpose of carrying out the Works. Furthermore, the Employer shall assist the Contractor in procuring any necessary Government consent and in obtaining clearance through Customs of the Goods imported for the Works. The cost of any permits shall be borne by the Contractor.
- 17.2.3. If requested by the Contractor, the Employer shall facilitate the transport of the imported items for Railway System works, via railway from Manila Port or an available nearest port to the Site, which, however, will not relieve the Contractor of any of his obligation under the Contract. The Contractor shall inspect the condition of Railway System equipment at Manila Port or an available nearest after customs clearance and also at the Site when arrived at the Site.
- 17.2.4. The Contractor shall use such routes and rights of access to the site as proposed by the Contractor and agreed by the Engineer from time to time. Routes for 'very large' or 'very heavy' loads shall be discussed with the Engineer in advance and all arrangements thereafter shall be submitted to the Engineer. In this context, the definition of the terms "very large" and "very heavy" refers to articles that cannot be transported by normal road vehicles or be handled by readily available methods.
- 17.2.5. The Contractor shall be responsible for obtaining permission from the traffic police and other relevant authorities to move “very large” and “very heavy” loads and for arranging police escorts if required. The Contractor shall ensure that all roads and pavements, etc. leading to and around the Site are kept free from obstructions and shall not cause inconvenience or hindrance to traffic or persons either by its vehicle or its workmen, scaffolding, plant, materials, equipment, etc. All workmen working on the road shall wear approved reflective safety vests at all times.
- 17.2.6. The Contractor shall repair damage caused to existing roads, footpaths, steps, cables, sewers, drains, etc. and shall reinstate the same at his own expense to the satisfaction of the relevant authorities.
- 17.2.7. Access road planning during construction/installation time in viewpoint of maintaining work progress for supply of materials and manpower, removal of construction disposals through public roads outside of MCRP & NSRP-South and railway in MCRP & NSRP-

South. It is required to secure transportation access from major roads for this project works.

- 17.2.8. Traffic Control Plan should be prepared and developed by the Contractor before or during the construction time. The Contractor strictly shall apply the plan with taking prior permission from the Employer, the relevant agencies, the Engineer / the Project Manager, and taking consent from the residents concerned.
- 17.2.9. The major access routes for construction vehicles will be the trunk road running in parallel with the MCRP and NSRP-South line. It is required to have some alternative plans to prevent the access roads from passing through high population and public density areas, such as residence and commercial areas, school, and hospital areas.

18. MEETING REQUIREMENTS

18.1. General

The Employer and the Engineer will conduct project meetings throughout the Contract period to enable an orderly review of the progress of the Works to be undertaken, and to provide for a systematic discussion of problems and issues if any.

Besides the project meetings above, the Employer and the Engineer will also conduct regular technical, construction and commissioning meetings with the Contractor at least once a fortnight at a location designated by the Engineer.

The Contractor shall also arrange and attend meetings as required by the Engineer.

The Contractor shall endeavor to ensure that his Subcontractors, suppliers, and sub-consultants attend meetings when so required.

As for the meetings not included in this requirement, such as the Contractor's relations with his Subcontractors and materials suppliers, and discussions relative thereto, these matters are the Contractor's responsibility and shall not be a part of project meetings content.

Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

To the maximum extent practicable, the Contractor should advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.

The Contractor shall compile minutes of each meeting and within 5 days furnish three copies to the Engineer for review and acceptance . The Contractor may make and distribute such other copies as he wishes.

All meetings shall be scheduled as per requirement. However, generally, Project progress and track possession meetings will be held monthly, and site meetings and the operating meetings fortnightly. Necessary coordination shall be made to establish a mutually acceptable schedule for meetings.

To the maximum extent practicable, monthly meetings will be held at the Engineer's Office, and site meetings at the Engineer's site office.

18.2. Monthly Progress Meetings

The Monthly Progress Meetings will be held at dates, intervals and times as determined by the Engineer. The agenda for the monthly progress meeting shall follow the contents of the Monthly Progress Report. It may also be necessary to hold review meetings at regular intervals at management levels as deemed necessary by the Engineer. Such meetings shall generally be arranged at the place of activity concerned.

18.2.1. Attendance: To the maximum extent practicable, the same person or persons who shall represent the Contractor at project meetings shall attend throughout the progress of the Works including the person responsible for Document Control. Subcontractors, material suppliers, and others may be invited to attend those project meetings in which their aspects of the Works are involved.

18.2.2. The Contractor shall submit a Project Progress Report to the Engineer. The Project Progress Report shall be prepared in accordance with the Engineer's requirement and shall include, but shall not be limited to, the following items:

(1) Executive Summary

A summary of major events, overall progress, delays, recovery and financial matters. The Contractor's organization chart highlighting any changes to key personnel.

(2) Contract Summary

Contract Particulars and Variation Orders. This section shall contain detailed information about the financial and commercial status of the Contract, including details of actual and anticipated claims covering cost and time extensions.

(3) Design Progress / Manufacturing Progress / Installation Progress / Testing and Commissioning Progress / Trial Operations;

A summary of the Contractor's manufacturing / installation progress with details of any areas of concern or delay and any areas of technical difficulties incurred or expected to be specifically highlighted, together with details of the Contractor proposals for corrective actions. A summary of manpower, plant and equipment on site shall also be included.

(4) Design

Summary, including critical design issues and interfaces and status of design submissions.

(5) Manufacturing Status

This section shall contain detailed descriptions of all manufacturing achievements in the month including any problems encountered, comparing the planned works with the actual works.

(6) Procurement and Delivery Status

This section shall contain the detailed progress of all procurement items and delivery activities (construction and permanent plant), both planned and actual.

(7) Discussion on any other business.

(8) Environmental Management

(9) Quality Assurance and Quality Control

- (10) Progress Videos and Photographs
- (11) Updated Baseline Programme with progress update status as at the report cut-off date as specified by the Engineer.
- (12) Risk Management / Register Report
- (13) Other items as required and to be advised by the Engineer.

18.3. Programme Analysis Report

18.3.1. The Contractor shall submit a Programme Analysis Report to the Engineer together with the Monthly Progress Report and all related programme submissions which shall comprise a narrative statement that identifies the basis of the Contractor assumptions and to include:

- (1) The content required to be included in any programme or supporting document needs to be clearly identified and described to ensure a clear understanding of the scope / requirements of each document provided, i.e., activity detail and activity durations, sequence of working etc.
- (2) The critical path of the Works;
- (3) Daily and weekly working hours, holidays and shift patterns;
- (4) Assumed production outputs for all major activities and areas of the Works.
- (5) An overall manpower forecast detailing individual traders and other sub-contract / indirect labor, commissioning teams etc. to illustrate the build-up of manpower resources. The format is to be in accordance with the Engineer’s requirements;
- (6) List of major items of plant or equipment that are required to be procured identifying the required lead times;
- (7) S-curves and histograms showing the planned weekly figures for each principle quantity, major items of equipment and major manpower trades;
- (8) Any programme constraints, giving details of the constraints and the substantiation thereto;
- (9) When supplied with a Three Month Rolling Programme or current Baseline Programme, it shall include a summary of progress achieved in the previous period in terms of principle quantities (planned versus actual) and time gain / loss in terms of days for each activity;
- (10) All computerized network diagram and bar chart updates shall be accompanied by the following output reports;
 - A complete listing of activities sorted by sub-network early start . early finish with total “float time” calculated for each:
 - A tabular report of design submittals;
 - A tabular report of test, demonstrations inspections; and
 - S-curves indicating the “scheduled” and “actual” progress in a cumulative fashion, the schedules progress curve shall be prepared to show early and late profiles.
- (11) Outline installation method statements;
- (12) Details of access and working arrangements, in particular with interfacing parties;

- (13) Assumed periods for dealing with third party works such as utility companies, interfacing contractors or statutory bodies etc.;
- (14) Details of the proposed sub-contract arrangements;
- (15) Coding libraries and structures;
- (16) Programme recovery / mitigation analyses.

19. LIAISON WITH OTHERS

19.1. Approvals from Government Authorities and Agencies

The Contractor shall assist the Employer to make all necessary arrangements with and obtain all necessary approvals from Government departments, utility agencies, and other relevant competent authorities.

19.2. Meetings with the Engineer

The Contractor shall arrange and attend meetings as required by the Engineer. The Contractor shall use its best endeavors to ensure that its Subcontractors, suppliers, and sub-consultants attend meetings when so required.

19.3. Meetings with the O&M Concessionaire

The Contractor shall arrange and attend meetings with the O&M Concessionaire. These meetings shall commence from the time the O&M Concessionaire is appointed until the end of the Defects Notification Period.

19.4. Meetings with Government Departments and Agencies

When the Contractor arranges meetings with External Interfacing Parties including government departments and utility undertakings or Interface Contractors, it shall inform the Engineer at least four (4) official working days (excluding general holidays) or such shorter period permitted by the Engineer, before they are to be held and shall give the Engineer and the Employer the agenda and objective of the meetings.

19.5. Correspondence with Government Departments and Agencies

Copies of correspondence received from or dispatched to Government Departments, utility undertakings, and Interface Contractors shall be submitted to the Engineer for information within two (2) days of receipt or dispatch.

20. INTERFACE MANAGEMENT

20.1. General

The Contractor’s responsibility for interface coordination shall include interfacing with the previously described Interface Contractors and those who may be identified in the future such as local authorities, statutory bodies, utility undertakings, private service providers, consultants, or other contractors whether or not specifically mentioned in this Contract. This responsibility is not limited to a particular number of Interface Contractors.

Each of the Project Contractors shall be responsible for coordinating their own works with those of Interfacing Contractors, Statutory Authorities and other External Parties, whether or not specifically identified herein, and in order to do so, they are required to participate in an information transfer and management process in accordance with the procedure given below.

The System-Wide E&M Works are the most significant element of the Interface Information flow requirements; therefore, the Contractor shall take a pivotal role in the overall Interface Management process of the Project.

Appendix 7 contains the Outline Interface Matrix (OIM) with the respective civil packages from which the Contractor shall subsequently develop a consolidated draft Detailed Interface Matrix and shall convene the first of a series of regular Interface Coordination Meetings which will be chaired by the Engineer and shall be attended by all interfacing Contractors. The consolidated document shall be reviewed and revised following these meetings and shall be released as a Consolidated Detailed Interface Matrix (CDIM), which will be monitored and used for Interface coordination and progress monitoring. The CDIM shall include all interfaces i.e., Intra System Interfaces, Inter-systems, and external Interfaces.

The Contractor shall develop an Outline Interface Matrix (OIM) for each of the following but not limited to:

- a) Track Works
- b) Signaling System.
- c) Telecommunications
- d) Power Supply system at substations.
- e) Power Distribution System
- f) Overhead Contact line System
- g) Automatic Fare Collection System
- h) Depot & Workshop Facility installation at depots.
- j) Platform Screen Doors
- k) any other system under the scope of work or specified elsewhere in the contract.

The CDIM will continue to be a live document, subject to modification and addition by common agreement between the Package Contractors as the Works proceed

The Contractor shall prepare detailed System Architecture Drawings (SAD) covering all areas of scope included in the Contract. Level 0, Level 1, and Level 2 SAD’s shall be submitted and given a Notice of No Objection during the preliminary, pre-final, and final design stages respectively.

20.2. Exchange of Information with Interfacing Contractors

The Contractor shall communicate, coordinate, and exchange information directly with Interface Contractors. Information necessary to fulfill the Contractor’s interface obligations shall be directly requested and obtained from the Interface Contractors; receipt and acknowledgment procedures is required. Conversely, the Contractor shall provide directly to the Interface Contractors information within the Contractor’s scope.

The Contractor shall develop and submit for approval by the Engineer an Interface Control Document for each sub-system and Other Works Contractor. 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. It shall be signed off by the Contractor, his sub-contractors, and the interfacing Contractors, prior to submission. The submission date of each Interface Control Document shall be coordinated with that of the respective other parties. The Interface Control Document shall:

- a) Clearly identify the demarcation between the sub-system, his subcontractors, and Other Works Contractors;
- b) Describe detailed physical, electrical/ mechanical, and functional interfaces (such as protocols, software, and data structures) between the sub-system, his sub-contractors, and Other Works Contractors;
- c) Identify the information to be exchanged between the sub-system, his sub-contractors, and Other Works Contractors with a timeline that complies with the overall Project program as well as the contracts of the respective parties;
- d) Define Design, Manufacture, Supply, Installation, Testing, and Commissioning responsibilities;
- e) Address the Design, Manufacture, Supply, Installation, Testing and Commissioning program of the interfaces to meet the key dates of each contract, and highlight any program risks requiring the Engineer's attention;
- f) Specify the proposed method and schedule for verifying interface integrity along with any requirements, whether temporary or permanent, relating to the physical installation of each party's equipment or materials used for the Works; and
- g) Include test procedures and a program to demonstrate the performance and integrity of the integrated systems.

The Contractor shall communicate and co-operate with the Interface Contractors to identify and resolve potential interface problems.

The Contractor shall allow for the fact that many of the design activities of the Interface Contractors may proceed concurrently to the construction of this Contract. Specific dates for the delivery of this and other required information shall be confirmed between the Contractor and the Interface Contractors.

The Contractor’s program shall allow for the timing of availability of necessary interface information from the interfacing parties.

20.3. Request for Information

All requests for information (RFI), acknowledgment of receipt of information, and any official communication between the Contractor and the Interface Contractors shall be made in writing with a copy to the Engineer for information.

20.4. Interface and Co-ordination with Interfacing Contractors

The Contractor shall advise the Engineer in writing of any problems encountered in obtaining necessary information and/or lack of co-operation from any Interface Contractor. In the event that the Engineer considers that the resolution of an interface is not proceeding satisfactorily, the Engineer will review the matter and establish a coordinated plan directing the Contractor and the Interface Contractors as to the required

action.

20.5. Meetings with Interfacing Contractors

The Contractor shall conduct regular meetings with the Interface Contractors to clarify particular aspects of the interface requirements of the Contract Works and the related works. The party who convenes the meeting shall prepare minutes recording all matters discussed and agreed at the meeting. The Contractor shall advise the Engineer in advance of the date, time, and location of such meetings as he may elect to attend.

20.6. Issuance of Information Related to Interfaces and Coordination

The Contractor shall ensure that copies of all correspondence, drawings, meeting minutes, programs, etc. relating to the Contractor’s coordination with Interface Contractors are issued to all concerned parties and the Engineer no later than two (2) calendar days from the date of such correspondence and meetings.

20.7. Liability for Failed Interfaces

Any claim of additional costs by Interface Contractors resulting directly from the Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and updating of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each stage of the Works.

20.8. Design Co-ordination with Interface Contractors

The Contractor shall undertake design co-ordination with Interface Contractors within periods for design interfacing and coordination. The Contractor may commence design interfacing with Interface Contractors prior to the given period once information has been developed to a level where meaningful interaction can take place. The end of the design interfacing and co-ordination period indicates the deadline for receipt by the Engineer of a notice from the Contractor and each of the Interface Contractors stating that design co-ordination has been completed and that designs have been reviewed to ensure consistency between the designs proposed by the Contractor and the respective related Works Contractor. Typically, design interaction should include the followings:

Definition and agreement with Interface Contractors of interface areas, Contract limits, shared loads, physical work interfaces, sequence of installation, and or testing of systems.

The Contractor shall fully co-ordinate the design of the Contract Works with the design of Interface Contractors and shall follow the interfacing requirements detailed in the Technical Requirements (ERT).

The Contractor shall ensure that the requirements of each Interface Contractor are fully coordinated and provided for in the design of the Contract Works. The Contractor shall interface and liaise with Interface Contractor and other contractors in accordance with the requirements of the Technical Requirements (ERT).

Definition and design approach by the Contractor with Interface Contractors for civil and structural works or type, size and location of equipment and control rooms, access routes thereto, embedded ductwork and other cast-in items such as lifting hooks and eyes, fixing bolts and sockets, agreement of installation programming, preparation of coordinated

installation plan, etc. shall be done.

Where an Interface Contract is yet to be awarded, the Contractor shall proceed with the coordination activities with the Engineer until such time as the Interface Contractor is available. The Contractor shall provide the Interface Contractor with all information necessary to enable the Interface Contractor to follow-on and proceed with their co-ordination.

20.9. Construction Interfaces and Co-ordination

The Contractor shall undertake installation during periods for installation interfacing and coordination. The installation interface and co-ordination period indicate when its Subcontractors and/or Interface Contractors shall have access to areas within works areas for Interface Contractors to undertake their work. It shall be incumbent on the Contractor to define more closely with Interface Contractor the details of its activities within areas where work is to be carried out and to require the same to be described in interface documents. During the installation interface period, the Contractor shall have priority in working within areas to which access has been granted. The end of the installation interface period indicates when the Contractor shall finish its principal installation work within the given areas to which access has been given.

The Contractor shall coordinate and cooperate with Interface Contractors on all site-related matters including but not limited to site access and occupation, safety, verification of work compatibility, and survey control. The Contractor shall advise the Interface Contractors in advance when a construction item is ready for field inspection to verify compatibility with the interfacing parties’ needs and shall facilitate access to the Site for the Interface Contractors.

On advice from the interfacing parties that an as-constructed interface-related element is ready for inspection, the Contractor shall:

- Conduct on-site inspections of the work elements and give comments in writing to the Interface Contractors.
- Agree in writing to the interfacing parties that the as-constructed work meets the interface requirements.

20.10. Interface Management Plan

Interface Contractors are listed in Section 4.3.1 of this ERG are to be included in Interface Management Plan and the Organization Chart (Interfacing).

The Contractor shall fully co-ordinate the design of the Contract Works with all relevant bodies and entities, in particular government authorities, departments and regulatory bodies, utility companies, and the consultants and contractors of adjacent Projects whether ongoing or planned.

Interface issues and their resolution shall be regularly addressed in the Monthly Progress Report. All submissions shall conform to interface requirements.

As a minimum, the IMP shall contain the content as in Table 20.1 below. The intention of each section of IMP is described by the text inside the right-hand column in *italics*.

Table 20.1: Interface Management Plan

1	Introduction	
1.1	Purpose of the Document	Describe the methodology to be adopted by the Contractor in managing all interface issues
1.2	Overview	Project overview of the Contractor and Interface Contractor interfaces
2	Resource Management	
2.1	Organization and Roles & Responsibilities	Description of organization structure
2.2	Resource Requirement	Detailed description of the manpower, tools, logistics shall be included in this section
3	Interface Requirements	
3.1	Allocation of Interface Requirements	This is an introduction to Section 3.2 below
3.2	Interface Description between Contractors	Outline Interface Matrix (OIM) shall be included in this section
3.3	Areas of Concern	Process for managing the interface concern
4	Process Management	
4.1	Change of Interface Requirement	The process for the management of interface requirement change to be addressed in this section
4.2	Verification and Validation of Interface Requirements	The approach to be adopted by the Contractor to manage verification and validation of interface requirements shall be addressed in this section
4.3	Testing and Commissioning on Interfaces	The approach to be adopted by the Contractor for the management of interface in the Testing and Commissioning stage shall be addressed in this section
4.4	Quality Procedures	Contractor’s internal quality procedures applicable for the interface management shall be listed here

5	Document Management	
5.1	Reference Documents	All applicable reference documents shall be listed in this section
5.2	Structure of Reference Documents	The structure of reference documents shall be addressed in this section
5.3	Version Control of Interface Documents	Configuration management of interface documents shall be addressed in this section
6	Communication	
6.1	Terms of Reference of Interface Meetings	The terms of reference of interface meetings shall be addressed here
6.2	Exchange of Information between Contractors	The process for the exchange of information between the pair-wise contractors (Interface Contractors) shall be stated here
6.3	Submission to Engineer	The approach to be adopted by the pair-wise contractors on the submission of the Interface Management Plan to the Engineer shall be described here
6.4	Request for Employer’s Attention	The criteria and methodology on requesting for the Employer’s attention shall be mentioned here

21. SYSTEM ASSURANCE

21.1. General

21.1.1. System Assurance Management is applicable for all stages of the E&M systems and Track works development, including design, manufacture, testing, commissioning, systems integration, trial operations, and in-service operations.

21.1.2. The Contractor shall submit a comprehensive System Assurance Management Plan (SAMP) which contains all requirements within section 4.6 of this document, for the Engineer’s review.

The System Assurance Management Plan shall cover Reliability, Availability, Maintainability and Safety, Electromagnetic Compatibility (EMC), and Fire Safety strategy.

The System Assurance Management Plan shall comprise a program showing in detail the timing of each activity and the anticipated dates for submission of system assurance documentation. The program will break down the planned activities into discrete stages of work as a minimum design, manufacturing, installation, testing and commissioning

and RAM demonstrations.

System Assurance Management Plan shall clearly identify the reviews to be performed at the end of each stage of the program. System Assurance Report shall be submitted at the end of each stage of the program which covered all the subjects above. The Subsystem Assurance Plans will be consistent in approach with the System Assurance Management Plan. The SAMP shall be certified by the Contractor’s internal department or by a third-party independent engineer from the design and manufacturing section. The SAMP shall be specifically developed for this Contract.

- 21.1.3. A Taking Over Certificate (TOC) will be issued in accordance with General and Technical specifications of the contract, when all E&M systems/subsystems, Track Works and fully integrated works have successfully completed tests and integrated testing.
- 21.1.4. A Performance Certificate will be issued by the Engineer for the total performance of the E&M systems and Track works. This Performance Certificate is required to be achieved by the end of the Defect Notification Period (DNP). Prerequisites to obtain the Performance Certificate includes: Each E&M systems and Track works asset achieves its RAM and Safety targets.
- 21.1.5. The Contractor shall provide sufficient documented information for review by the Engineer. It is expected that the design demonstration of the E&M systems and Track works performance shall be achieved through supplier-based material self-certification, including cross-references to proven and accredited in-service performance of E&M systems and Track works supplied in a similar railway application.
- 21.1.6. With regard to Safety, it is expected that certification shall be achieved through supplier-based information via application of cross-references to previously certified acceptances from a reputable body (e.g., train operators, national railways authorities, independent accredited safety bodies, etc.) of similarly supplied E&M systems and Track works equipment, with a product-generic safety case application to be made based on existing safety certification.
- 21.1.7. System Assurance shall define system assurance processes and principles by which the Contractor shall deliver an integrated railway fit for acceptance by the Employer:

System Assurance shall:

- 1) Develop requirements for safety, RAM, and EMC;
- 2) Demonstrate compliance with the Employer requirements for safety, RAM, and EMC;
- 3) Deliver the required documentation, including safety cases, safety justifications, risk assessments, risk analysis, and demonstration of compliance with safety requirements;
- 4) Support compliance to safety legislation and standards for the purpose of certification of the various components of the Project for revenue service;
- 5) Define system assurance processes and principles by which the Interface Contractors/subcontractors shall deliver an integrated railway fit for acceptance by the Employer;
- 6) Deliver a compliant RAMS/EMC environment, as demonstrated in the design

verification and validated in the integrated testing and commissioning stage of the Project. In doing so, deliver safe functionality of all equipment for operational running, assuring the safety of passengers, staff, and the public.

- 21.1.8. The Employer shall conduct audits during design, development, manufacture, and testing and commissioning phases to ensure that the Contractor has met all relevant System assurance requirements. The Engineer shall give 7 days’ notice to the Contractor about the audit arrangement. The Contractor shall provide all necessary assistance to enable the Employer or his representative to complete the audit.
- 21.1.9. The Contractor shall follow System Assurance international standards primarily IEC 62278, IEC62279, and IEC 62425 or equivalent CENELEC standards, subject to review by the Engineer.

Table 21.1: E&M systems and Track works RAM and Safety Targets

RAM / Safety Targets	
E&M systems and Track works Operational Availability to support Train service	99.95%
Passenger serious injuries	<=2 per 20 Million passengers
Staff lost Time Injury	<=2 per 200,000 Manhours worked.

21.2. System Safety Assurance Management

- 21.2.1. The Contractor shall submit a System Safety Assurance Plan, which shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures in the design, manufacture, testing, and commissioning of the Railway Systems. The System Safety Assurance Plan shall cover safety procedures and regulations to be developed and the mechanisms by which they will be implemented for ensuring safety including Hazard Analysis, Fire control, EMC/EMI control, Safety Integrity Level requirement, site safety, etc.
- 21.2.2. The Contractor shall submit a System Safety Assurance Plan according to IEC 62278 or EN 50126 (Railway Applications- Specification and Demonstration of Reliability, Availability, Maintainability, and Safety) or any other equivalent international standard for the Engineer’s review as per schedule of Table 4-1 of Appendix 4 attached hereto.
- 21.2.3. System Safety Assurance Plan shall detail, but not limited to, the following:
- (1) Organization of the Safety team.
 - (2) Management of Safety-related interfaces with other contractors.
 - (3) Provisions and procedures for providing feedback to and interacting with other disciplines in the Contractor’s team, e.g., RAM, design, maintenance, and commissioning.
 - (4) Identified Safety requirements (including interfaces).
 - (5) Planned Safety assessments/analysis to demonstrate that the system safety requirements are met by the Contractor’s design.
 - (6) Safety methods to be used for the safety analysis.

- (7) Management of subcontractors’ Safety requirements.
- (8) Safety-related software management
- (9) Quality management
- (10) Configuration management
- (11) Verification and validation of assessments, including data.
- (12) Validation of Safety requirements during manufacture, installation, commissioning, and maintenance.
- (13) Audits and Review activities.
- (14) Record keeping of Safety assessments/analysis.
- (15) Hazard Log Management.
- (16) List of deliverables, including interim items listed within this document.
- (17) High-level schedule for deliverables.

21.2.4. The Contractor shall provide the following, but not limited to:

- (1) The Hazard Analysis report shall evaluate and ensure that all the hazards are identified and satisfactorily resolved to an acceptable level.
- (2) Safety assessment report demonstrating the Safety requirements are in compliant with Technical Requirements (ERT).
- (3) The Fire Safety Analysis report shall evaluate and ensure inter alia that the fire loadings of material proposed to be used, and the fire withstand ratings, etc. are as per the requirements specified in the Employer’s Requirements – Technical Requirements (ERT).
- (4) The EMC/EMI Control Plan shall evaluate and ensure that the requirements for electromagnetic compatibility and interference according to IEC 62236 or EN 50121 and as specified in the Employer’s Requirements - Technical Requirements (ERT) all elements of the system are met.
- (5) Design Safety Case and Final Safety Case to be submitted for the Employer’s approval.

21.2.5. Electrical/electronic/programmable electrical safety-critical equipment shall be assigned a Safety Integrity Level (SIL), depending on the contribution of this equipment to safety risks also as specified in Employer’s Requirements – Technical Requirements (ERT).

For example, a Computer-based Interlocking (CBI) System shall be at SIL 4 level.

Where not specified, the Contractor shall determine SIL requirements for electrical/electronic/programmable electronic safety-critical items in accordance with EN 50126, EN 50129, or IEC 61508 standards.

21.2.6. The Contractors shall prepare a Safety-Critical Item List of equipment and LRUs classified by their impact on safety for Employer review.

21.2.7. The Contractor shall submit an Engineering Safety Validation Plan, including but not limited to:

- a) the list of safety field verifications and validations for systems/subsystems/equipment during construction, manufacturing, installation, and systems interfaces integration testing;
- b) the schedule of safety field verifications and validations;
- c) the purpose of each verification and validation;
- d) the acceptance criteria by reference to any related safety study;
- e) the recommended method of testing, including the processing of key software safety issues in verification and validation;
- f) the plan for witnessing the results of verification and validation;
- g) the recommended format of the engineering safety validation report;
- h) the submission list of the Contractor’s test reports; and
- i) the recommended assessment procedure with respect to deficiencies in the verification and validation results.

21.2.8. Independent Assessment:

The Employer may appoint Independent Engineers and/or Independent Safety Assessors (ISA) to assess and advise on compliance with Contract requirements on System Assurance. The Contractor, interface contractors, subcontractors, and suppliers shall provide necessary assistance to Independent Engineers and Assessors, as required.

The independent assessment may undertake the following, but is not limited to:

- 1) Safety audits;
- 2) Safety reviews;
- 3) Design reviews;
- 4) Witnessing testing activities;
- 5) Review of the safety and quality organizational activities;
- 6) Review of the safety process; and
- 7) Assessment of hazard logs and safety cases.

21.2.9. The Contractor shall appoint their own Independent Safety Assessor for assessing safety-critical subsystems and/or safety-related software in accordance with EN 50128 and EN 50129.

Refer to APPENDIX 6 – Engineering Safety Management Plan for detailed Safety requirements.

21.3. Reliability, Availability, and Maintainability Management

21.3.1. The Contractor shall submit a RAM Plan as per IEC 62278 or EN 50126 or any other equivalent international standard for all the applicable Systems including but not limited to train control system, Rolling Stock, Signaling, PSD, Telecommunications, OCS, AFC, Power supply, Power distribution system, OCC, Depot Equipment and SCADA to

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

Item	System	RAM Target	
		Availability (%)	MTTR
15	Voice and Data system (mission-critical telephones)	99.95%	0.5 hours
16	Master Clock and Time distribution	99.8%	0.5 hours
17	Platform Screen Doors (PSD)	99.98%	1 hour
18	Computerized Maintenance Management System (CMMS)	95%	4 hours
19	Integrated Operations Control Center (IOCC)	99.95%	1 hour

**All the above values, may be subject to further review and revision.*

Table 21.3: PSD Performance Requirements

Sr. No.	Performance requirement – Platform Screen Doors (PSD)
1	PSD system shall have a failure rate of less than 1 in 1,000,000 operations cycle per door. (One operation cycle means one complete opening and closing cycle).
2	PSD system shall have MTTR as 60 minutes unless otherwise specified. (This time shall not include the time taken for the technician to arrive at the fault reported site).

- 21.3.7. Where appropriate, the Contractor shall also specify RAM (Reliability, Availability, and Maintainability) requirements for the design, operation, and maintenance of subsystems where the failure mode, effects, and criticality analysis (FMECA) identifies failure modes that have a maintenance, operations or safety impact, using the risk assessment methodology.
- 21.3.8. The Contractor shall conduct a Preliminary RAM Analysis which shall give an initial indication of any RAM problems which may arise which might affect the performance of the E&M Systems and Track works.
- 21.3.9. The Contractor shall adopt Reliability Block Diagram, Fault Tree Analysis, FMECA, or other appropriate methodologies to conduct RAM modelling and predict RAM performance so as to verify that the design of systems/sub-systems can achieve the Performance or RAM targets.
- 21.3.10. The Contractor shall provide RAM Demonstration Plan and RAM Demonstration report as necessary in the relevant stages of the project.
- 21.3.11. The Contractor shall provide a Reliability Critical item list which might impact the operations of the train or train service.
- 21.3.12. The Contractor shall provide all necessary references, assumptions, dependencies for the RAM data used for analysis.

The RAM evidence provided shall cover all RAM components of E&M Systems and Track works to be supplied and installed.

This shall include, but not limited to:

- (1) Availability, based on system architecture and component reliability;
- (2) Overall system availability;
- (3) Availability proof for significant components and functions demonstrated by RAM analysis (i.e., calculated failure rates, Reliability Block Diagram, failure mode analysis, etc.);
- (4) Determination of Reliability Critical item list;
- (5) Recommended preventive and corrective maintenance program;
- (6) Mean Active repair time analysis of all major modules;
- (7) Predicted holding spares requirements for the duration of the E&M Systems and Track works operational life cycles;
- (8) Lifecycle costs for ownership of the asset, i.e., capital, leasing, performance costs, part life renewal, preventive maintenance, fault and repair, spares and consumables, utilities (e.g. electric power, etc.), and decommissioning.

21.3.13. The Contractor shall supply further RAM data as requested by the Employer. The Contractor shall provide a RAM model of the final design which demonstrates the achievement of the RAM targets.

The RAM Model shall be supported by validated data from suppliers that are conforming to the corresponding sub-system RAM Targets.

21.3.14. The Contractor shall commence the use of the Data reporting analysis and corrective action system (DRACAS) prior to any factory or site acceptance tests and report to the Engineer on a regular basis.

21.3.15. During the DNP, the Operator shall collect and maintain data on the RAM performance to support the operational service availability. The Contractor shall collect RAM performance data from the Operator and submit monthly RAM Demonstration Reports to the Engineer.

21.3.16. In case the Contractor is not able to achieve the planned RAM targets, the Contractor shall take necessary corrective measures either by way of change of design of the relevant equipment/ component or software modification.

21.3.17. The Contractor shall analyze each and every failure or defect of the components of various equipment to determine the root cause of failure and to propose corrective measures, subject to review by the Engineer.

21.3.18. A record shall be maintained for each and every defect/failure in accordance with the DRACAS report to be submitted by the Contractor and reviewed by the Engineer.

21.3.19. Correction shall be made to components or subsystems that either fail to attain predicted availability levels or show Pattern Failure at the Contractor's expense.

21.3.20. During the in-service Defects Notification Period (DNP), the E&M Systems and Track works shall demonstrate successful achievement of the RAM targets, which will be a prerequisite of the application for a Performance Certificate to be issued by the Employer.

Failure to meet the E&M Systems and Track works RAM targets within the DNP shall mean that the DNP shall be extended until such time as the RAM targets has been met.

Regardless of the above, the maximum DNP is 4 years from the date of issue of the Taking Over Certificate.

21.3.21. Availability shall be assessed by the following measure:

$$\text{Percentage Availability} = \left[1 - \frac{[\text{DT(OPM)} + \text{DT(CM)}]}{\text{Total Time}} \right] \times 100$$

Where:

- (1) Total Time, is the time in hours in the assessment period, multiplied by the number of E&M equipment commissioned under the contract;
 - a. Assessment period: Shall be no less than 6 months running during DNP;
- (2) DT(OPM), or Down Time due to Other Preventive Maintenance, is the total downtime in hours due to Preventive Maintenance other than Service checks, summed over all sessions carried out on all E&M equipment, commissioned under the contract during the assessment period;
- (3) DT(CM), or Down Time due to Corrective Maintenance, is the total downtime in hours due to Corrective Maintenance, summed over all sessions carried out on all E&M systems, and Track Works, commissioned under the contract during the assessment period. Any unreasonable delay in handing – over the E&M systems and Track Works for repairs for reasons not attributable to the Contractor shall be excluded. Time spent on E&M equipment integrity inspections after E&M systems and Track Works restorations arising from corrective maintenance work shall be included.

The contractor must provide a Maintenance Level 1 turnaround time of not more than 7 days and a Maintenance Level 2 turnaround time of not more than 30 days.

21.3.22. Maintainability Requirements: Simplicity of maintenance, operation, emergency procedures, and ease of restoration of equipment; these together with ease of access inside the equipment shall be taken into account throughout the development of the design.

The maintenance regime proposed for the E&M systems and Track Works shall be developed design stage. A Failure Mode Effect Criticality Analysis (FMECA) shall be developed to include required maintenance derived from each failure mode.

The E&M systems and Track Works shall incorporate design, which reduces maintenance, substantially improving service intervals and component replacement. The design shall also minimize Mean Time To Repair (MTTR) and costs throughout the design life.

The MTTR time measurement shall include on-site diagnostics and rectification of the

failure (including software re-boot) up to the point that the system is restored to full functionality. In the event that the failure cannot be rectified, this time measurement shall include the time necessary to remove the failed piece of equipment from the System and replace it with a functioning one.

The MTTR does not include the time taken for designated personnel to arrive on-site (access time) to begin local diagnostic activities, neither the time taken for the replacement parts to be delivered to the site.

The Contractor shall submit the expected MTTR of the identified key E&M systems and Track Works subsystems.

- 21.3.23. The E&M Systems and Track Works shall operate with minimum attention between the specified inspection periods, and shall, under the operating conditions specified, operate between overhaul periods without requiring replacement of components other than those on the agreed list of consumable parts to be proposed by the Contractor and reviewed by the Engineer.

Special tools shall be avoided wherever possible. If they are required, they shall be supplied by the Contractor in sufficient quantities to meet the maintenance requirements.

Equipment design shall be modular to minimize downtime following the failures of equipment and components. Provision for mechanical handling devices shall be provided for any single piece of equipment weighing more than 35 kg. Equipment covers shall be provided with secure, visible, latching arrangements for easy inspection.

Should the electronic equipment be found to be faulty, the equipment shall enable fault finding to be carried out at the module level. This equipment shall allow fault finding down to the smallest replaceable item of equipment.

Equipment to which access will be required for fault finding shall be conveniently located. A list of such equipment and their location shall be supplied.

The E&M Systems and Track Works shall have provision for the isolation and where applicable, earthing of all electrical sub-systems to facilitate safe and systematic maintenance and fault diagnosis.

The above-mentioned features shall be suitably reflected in the respective design documents, as applicable, during the design stage.

21.4. Electromagnetic Compatibility (EMC) Management

- 21.4.1. The contractor shall prepare an EMC Management plan and evidence of EMC assurance submissions. The plan shall show that the process to manage risks due to electromagnetic disturbance is acceptable and meets the ALARP principle.

- 21.4.2. The EMC management plan shall capture how all supplied equipment and systems are verified compliant with the requirements of the relevant standards e.g. the EN 50121. This shall include:

- (1) Appropriate tests standardized emissions and immunity conducted and radiated, continuous and transient.
- (2) Good engineering practices for installation

(3) Specific design, implementation, and integration for earthing and bonding.

21.4.3. The Contractor’s EMC submissions shall provide evidence showing that all equipment, systems, and installations have taken all necessary measures to ensure all objectives, contractual, and Employer’s design requirements with regard to EMC are fully met.

21.4.4. The EMC management should take into account the current and future EMC Environment surrounding the railway corridor.

21.5. Engineering Change Management

21.5.1. The Contractor shall manage the Configuration Control of all software changes, and notify the Engineer through the Configuration and Change Control process, of any changes to Software or Hardware baselines, including an updated Schedule of all Software/Hardware assets/fixed or moveable, installed within the Station/Tunnel/Depot Systems or Trains.

21.5.2. The Change Management process shall be included in the System Assurance Management Plan.

21.5.3. Implementing Engineering Changes to the existing agreed baseline design can often introduce, new safety risks into the existing Design. It is therefore highly important that the Engineering Change, is managed through a defined Change Management process, and that the impact upon safety risk is considered as part of the change management process.

21.5.4. The Contractor and the respective Subcontractors shall implement a robust Engineering and Configuration Change Management Process, that nominally includes the following:

(1) A systematic identification process to identify possible hazards associated with the proposed change;

(2) Performance of a Risk assessment to determine the effects of the proposed change on the overall system risk;

(3) Identification of any necessary control measures, in order to reduce the overall safety risk to ALARP;

(4) Design solution details, to include the mitigation measures into the change;

(5) Review and approval of the proposed change by the Engineer and Employer.

21.5.5. To finalize the process, the Contractor shall prepare and submit to the Engineer an Impact Assessment Report, documenting the above to describe the effects of the change on system safety. This shall include the impact on related safety assumptions and requirements, systems and subsystems design and test, documented safety evidence and deliverables, etc.

22. REQUIREMENTS MANAGEMENT

- 22.1.** The Contractor shall implement progressive assurance approach to manage & govern the project requirements in an integrated way with a complete traceability throughout the project lifecycle as per EN 50126.
- 22.2.** The Contractor shall prepare and submit to the Engineer a Requirement Management Plan within thirty (30) days of the date of the commence date. The Requirement Management Plan shall define the processes employed by the Contractor to ensure that all appropriate requirements are managed to ensure the proposed design solution meets the design requirements and demonstrated through verification and validation evidence.
- 22.3.** The Contractor shall implement “ComplyPro” as the Requirement Management software for tracking and management of requirements compliance in the project. All the costs associated with the software usage and maintenance shall be under the contractor’s own cost.
- 22.4.** The contractor shall appoint a suitably qualified and competent persons to carry out requirements management.
- 22.5.** The Contractor shall develop a database of all requirements associated with a number of definition documents defined such as but not limited to, the ERG and ERT. The Contractor will then provide evidence that the identified requirements have been managed appropriately. The database shall:
- (1) Ensure that the criteria for the purpose of verification and validation of the Requirements has been recorded with appropriate attributes assigned;
 - (2) Clearly identify requirements that have a direct impact on Safety and RAM performance.
 - (3) Hazard log management and Control measure management (Safety requirements);
 - (4) Interface register and Management;
 - (5) Ensure that compliance of the complete set of the Requirement can be demonstrated with evidence formally recorded;
 - (6) Ensure that the Requirements are consistent and traceable back to their sources, and any gap/mismatch in the Requirements are clearly identified;
 - (7) Establish formal deliverable which will support stage design reviews and the overall engineering management processes;
 - (8) Track and record Requirement changes and facilitate impact analysis on Requirement changes; and
 - (9) Track and record assumptions, if there are any, evaluating the stability of, and the impact on, the Project if any of the assumptions prove to be true or false, defining the actions necessary to make progress and monitor the assumptions, and scheduling when assumptions are to be validated and reviewed throughout the Project’s life duration.
- 22.6.** The Contractor shall issue a monthly status report showing the status of the Requirement Management and information such as the number of open and closed requirements.
- 22.7.** Each design submission shall be accompanied by a design statement and compliance matrix which describes the scope and content of each submission, its underlying assumptions, and non-conformances.

- 22.8.** The Contractor shall use the Requirements Management software “ComplyPro” as the platform to implement the DRACAS process starting from Factory Acceptance Test; continue during site Testing and Commissioning, Trial run until handover to O&M Concessionaire.
- 22.9.** Requirements Management evidence shall be presented as part of the design submission stages and at other regular stages in the manufacture, construction, implementation, installation, commissioning, and handover, as requested by the Engineer.
- 22.10.** A final output of ComplyPro shall be the demonstration of achievement of the safety requirements for the work under the Contract and shall be used to support the final safety case.
- 22.11.** The Contractor shall provide a minimum of 10 no. user licenses for the Requirements Management software “ComplyPro” to the Engineer and Employer which shall be used until the start of revenue service of the final section of the line.
- 22.12.** The Contractor shall have sufficient licenses for their own use to cover their scope of works and activities to be undertaken.

23. ASSET MANAGEMENT

- 23.1.** Asset management, work planning, work history, and asset performing reporting will be carried out using a Computerized Maintenance Management System (CMMS). The CMMS is a software-based system that will be available to the maintenance and operation organization with equipment at the Depots and OCCs.
- 23.2.** The Contractor shall produce an Asset Management Plan within ninety (90) days after the commencing of work.
- 23.3.** Plant and Material shall be designed to meet the Requirement for the specified design life in ERT.
- 23.4.** The design life of the system and components shall be considered during the project design stage.
- 23.5.** The total life cycle cost approach shall be adopted in evaluating design alternatives. System design shall be optimized with respect to the total cost of initial acquisition, operation, maintenance, system support, and disposal over the life cycle. The Contractor shall provide supporting data and technical analysis to demonstrate compliance with this requirement.
- 23.6.** An adequate supply of spare parts and test equipment shall be made available for a period of time from completion of the Works in accordance with Obsolescence Management Plan. The Contractor shall notify the Employer/Operator at least six (6) months prior to deleting any component of the supplied equipment from general availability and guarantee to provide functionally replacement units for the remainder of such specified period of time.
- 23.7.** All assets data are to be deposited and managed in the System Configuration Database Platform as part of the delivery of CMMS.
- 23.8.** The Contractor shall provide an asset register for populating the CMMS Database server. The register shall comprise, but not limited to:

- (1) Part name;
- (2) Part number;
- (3) Functional use;
- (4) System, sub-system, equipment, and component-level hierarchy for populating the CMMS Database configuration;
- (5) Maintenance requirements.
- (6) Maintenance history;
- (7) Asset Condition
- (8) The useful life of asset.
- (9) Spares stock holding;
- (10) Supplier;
- (11) Contact name and address.

23.9. The Contractor shall provide administrative schedule information for populating the CMMS database server. The schedule shall include but not limited to:

- (1) Personnel details;
- (2) Training;
- (3) Warranties;
- (4) Work schedule;
- (5) Job cards.

23.10. All warranties shall be transferred to the Employer/Operator. All spares, special tools, and equipment shall be supplied to the owner/Operator.

23.11. The Contractor shall produce an Obsolescence Management Plan for review within ninety (90) days after the commencing of work.

23.12. The plan shall consider the project related risk associated with the obsolescence issue in connection with equipment/spare parts, hardware, and software during the design. And though to its first estimated obsolescence phase.

23.13. Obsolescence shall be evaluated by the Contractor when planning the levels of spares holding.

23.14. The Contractor shall submit an Obsolescence Management Report for review at the conclusion of the final design. The report shall contain details of the management of the system and components throughout the life of each asset.

24. DEMOBILIZATION AND CLOSING WORKS

24.1. Demobilization

This section specifies the carrying out of final closeout activities in preparation for completion of all construction and installation work under the Contract; all in accordance with the Contract Documents.

24.1.1. Demobilization will be considered as complete when all of the Contractor's Equipment, materials, personnel, Temporary Facilities, construction plant or otherwise belonging to the Contractor not required for the Defect Notification Period have been removed from the project site.

24.1.2. Demobilization shall include providing required submittals prior to close-out of the Works, including but not necessarily limited to the following:

- Spare parts, tools, equipment, machinery, and rail vehicles required by the Contract,
- Operating and maintenance data as required,
- Project "As-Built Drawings" and documentation as required,
- Railway equipment as required under these specifications,
- Schedule and price of Plant installed under the contract,
- Schedule of installed works and materials, and
- Contractor's completion report and photo and video record.

24.2. Closing Works

Closing works shall be inspected by the Engineer and/or the Employer as the condition's pre-requisite to completion inspections - written notice submitted by the Contractor requesting a final or partial completion inspection.

Inspection by the Engineer and/or the Employer shall mean that the Works is substantially complete, and the Contractor has:

- Inspected and checked all the Works installed,
- Compared all the Works with the drawings, specifications, and submittals given a Notice of No Objection by the Engineer.
- Confirmed that all conditions, provisions, and requirements of Contract Documents have been fulfilled, other than any maintenance and incidental works and procedures necessary to follow,
- Clean-up operations complete,
- Temporary Facilities and utilities properly disconnected and removed, except those needed for the Defects Liability Period,
- Systems, equipment, and devices properly adjusted, serviced, tested, and fully operable,
- Materials and finishes neat, clean and undamaged; accessory parts and items securely attached,
- Broken or damaged work repaired or replaced as required,
- Spare parts delivered and stored as required,
- Recovered materials catalogued and neatly stacked for removal by the Engineer,
- Test reports and other required documentation assembled and delivered to the Engineer,
- The documents including manuals, and warranties, assembled and delivered to the Engineer, and
- Written notice of readiness for Final Completion Inspection filed with the Engineer.

24.3. Training Completion

Training will be required to be completed before the commercial operation of trains by the Contractor. Training requirements details are given in Section 14 of the General Requirements (ERG) as well as the Technical Requirements (ERT).

25. SECURITY AND INSURANCE

25.1. Security

The Contractor shall provide the following securities in accordance with the Contract requirement:

- Performance Securities; and
- Other Securities, as required under the Contract.

The detailed requirements are stipulated in the General Conditions and the Particular Conditions.

25.2. Insurance

The Contractor shall purchase and maintain the following insurances in accordance with the requirements stipulated in the General Conditions and Particular Conditions:

- Insurance for the Works (Contractor’s All Risk Insurance);
- Insurance for the Contractor’s Equipment;
- Insurance against Injury to Persons and Damage to Property (Third Party Liability Insurance);
- Cargo Insurance during Transport (Marine Cargo Insurance, Inland Transport Insurance);
- Insurance for Contractor’s Personnel (Workers’ Compensation, Employer’s Liability);
- Automobile Liability Insurance; and
- Other Insurances as may be required under the Law of the Country or agreed specifically agreed between the Employer and the Contractor.

26. PUBLICITY AND PUBLIC RELATIONS

26.1 General

The Contractor shall prepare and submit a Public Relations (PR) Plan to the Engineer. The Contractor shall also carry out PR activities and public consultation works with the instruction and guidance of the Engineer. The responsibilities of the Contractor shall, without limitation, include:

- a) Coordinate public relations matters and exercises with the Engineer and keep the Engineer informed at all times of relevant issues;

- b) Engage and liaise with relevant local Government departments, other authorities and key stakeholders to develop and coordinate public relations exercises;
- c) Establish a sense of partnership among the Government and stakeholder groups in the implementation of the Project;
- d) Promote the Project to the public and the parties concerned with a positive message and explain the benefits which will be realized by the development of the Project;
- e) Gain support and minimize objections from the community and concerned parties;
- f) Ensure adequate transparency of the Project to the public and key Stakeholders;
- g) Implement a robust process for receiving, addressing and tracking comments, criticism and complaints from all parties during the Contract;
- h) Resolve public relations issues arising during the course of construction and elevate major issues to the Employer via the Engineer, as required;
- i) Prevent and/or mitigate any nuisance or disturbance to the public due to the construction activities at the earliest possible time;
- j) Attend and answer queries for the purpose of public consultation including but not be limited to LGUs, PNR, Emergency Services, Stakeholders, Employer, related competent agencies, Non-Governmental Organizations (NGOs) or individual members of the public, local authorities and people in the affected areas, during and outside normal office hours;
- k) Prepare and supply all necessary drawings, photomontages, documents, consultation papers, presentations, display materials for public consultations; and
- l) Provide assistance and information to facilitate all Public Relations (PR) activities as per the PR Plan and as instructed by the Employer and the Engineer.

The Contractor shall nominate a qualified and experienced Public Relations Manager to manage and coordinate the required public relations responsibilities.

26.2 Public Relations Plan

The Contractor shall submit a Public Relations (PR) Plan to the Engineer within twenty eight (28) calendar days of the Commencement Date. The PR Plan shall include the methodology, specific ways and actions to be carried out for informing and consulting the public and promotion of the Project.

The PR Plan shall also include the methodology specific ways and actions to handle reactions from the public, in particular issues relating to congestion, pollution, vibration, ground movement, noise, nuisance, compensation, etc.

The PR Plan shall give proposals and details on effective liaising, consulting, informing, meeting, contacting, clarifying with the public and gaining their support and

understanding on the importance and benefits of the Project and the mitigation measures to reduce the impacts which may generate during execution of the Works.

The Contractor shall update quarterly and submit the PR Plan including a summary of PR events conducted and complaints, queries handled in the past quarter and PR events to be conducted and complaints and queries envisaged in future, throughout the Contract Period.

26.3 Public Consultation

The Contractor shall undertake public consultation works with the guidance of the Engineer, including but not be limited to, the following:

- a) Inform and consult the relevant Government departments and authorities concerning the Project, local residents, property developments, shops, schools and sensitive receivers at least two months prior to the commencement of construction works;
- b) Attend and participate in all public consultations and PR exercises;
- c) Gain support, ease concerns and minimize objections from the public affected by the construction works through public consultation;
- d) Address public concerns and feedback as far as possible to minimize disturbance to the public during construction, at the Contractor’s own expenses; and
- e) Report and give presentations to the Engineer, Employer, stakeholder agencies, NGOs and local authorities of the affected areas, etc., about the progress of the construction works and other information as requested.

The Contractor shall ensure proper communications with the public by establishing an effective communication channel. The communications shall be open and transparent in the form of an interactive two-way system. Stakeholders and parties concerned shall be updated regularly on the progress of the Works and implementation of the Project through an easily accessible system, in particular on matters relating to local traffic control arrangements, expected delays etc. Queries, feedbacks and comments from the Stakeholders and parties concerned shall be considered and handled properly in an effective manner.

An effective communication system of on-Site notices, website and phone hotlines shall be established by the Contractor.

26.4 Public Relations Tools

The Contractor shall provide and make use of, but not be limited to, the following Public Relations tools in carrying out its PR duties.

26.4.1 Website

The Contractor shall establish a website with the guidance of Engineer and Employer which gives a clear description of the Works, indication of anticipated completion date, public relations exercises, traffic control issues and details of the enquiry hotline. The

website shall be updated regularly to ensure that the information is up to date. The site shall make provision for the public and stakeholders to submit comments, feedback and complaints, which shall be addressed and responded to by the Contractor as per the PR Plan.

26.4.2 On-Site Notices

The Contractor shall post on-Site notices with the guidance of Engineer with clear description of the Works and indication of anticipated completion date together with the enquiry hotline and internet website information. Advance notices shall be given in carrying out the Works which maximize the impact on local residents.

26.4.3 Hotline

The Contractor shall set up a twenty-four (24) hour hotline with the guidance of Engineer to provide enquiry services to the public and the Contractor shall ensure queries and enquiries regarding the Works are taken seriously and dealt with swiftly. Whenever a complaint is received, response shall be made within seven (7) calendar days. If a longer processing time is needed, an interim reply shall be served to the complainant within seven (7) calendar days.

26.4.4 Construction Site Tour

The Contractor shall cooperate with and provide periodical tours of the Works to the public and stakeholders during the construction period. The main target audiences are stakeholders, ordinary families and students. Site visitors can become a means for advertising and promoting the benefit of the Project. Tours shall be planned at least once in every three months with the instruction of Engineer.

26.5 Co-ordination with Other Contractors

The Contractor shall coordinate with External Interfacing Parties and Interface Contractors in the implementation of public relations activities.

APPENDIX TO GENERAL REQUIREMENT

TABLE OF CONTENTS

Appendix 1:	General Abbreviations
Appendix 2:	Program
Appendix 3:	Monthly Progress Report
Appendix 4:	Submittals
Appendix 5:	Quality Assurance Requirements
Appendix 6:	Engineering Safety Management Plan
Appendix 7:	Outline Interface Matrices
Appendix 8:	Outline Interface Demarcation with MMSP and NSCR

APPENDIX 1- GENERAL ABBREVIATIONS

Abbreviation	Description
A0 to A6	International Document Paper Sizes
AC	Alternating Current
ANSI	American National Standards Institute
AFC	Automatic Fare Collection
AREMA	American Railway Engineering and Maintenance of Way Association
ASTM	American Society for Testing and Materials
BMS	Building Management System
BS	British Standard
CAD	Computer-Aided Design and Drafting
CAR	Corrective Action Request
CCTV	Closed Circuit Television
CDIM	Consolidated Detailed Interface Matrix
CIF	Cost, Insurance and Freight
CMMS	Computerized Maintenance Management Systems
CP	Contract Package
CP NS-02	Contract Package (Rolling Stock)
CP NS-03	Contract Package (Rolling Stock- Limited Express)
CPM	Critical Path Method
CT	Current Transformer
DC	Direct Current
DCC	Design Certificate Consent
DNP	Defect Notification Period
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DRACAS	Data reporting analysis and corrective action system
DRCA	Design Review Certificate Application
E&M	Electrical & Mechanical
EDMS	Electronic Document Management System
EIA	Environmental Impact Assessment
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EMU	Electric Multiple Unit
EN	European Norms
ER	Employer's Requirement
ERG	Employer's Requirements-General Requirements
ERT	Employer's Requirements-Technical Requirements
ETCS	European Train Control System
GC	General Conditions of Contract

Abbreviation	Description
GHG	Global Greenhouse Gas
GPS	Global Positioning System
HV	High Voltage
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronic Engineering
IP	Internet Protocol
IMP	Interface Management Plan
IOCC	Integrated Operation Control Center
ISO	International Standardization Organization
JDT	JICA Design Team
JEC	Japanese Electrotechnical Committee
JEITA	Japan Electronics and Information Technology Industry Association
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
LED	Light Emitting Diode
LV	Low Voltage
MCRP	Malolos Clark Railway Project
MCS	Material Control Schedule
MMSP	Metro Manila Subway Project
MTBF	Mean Time Between Failures
MTTR	Mean Time to Restore
NC	Normally Closed
NGCP	National Grid Corporation of the Philippines
NO	Normally Open
NSCP	National Structural Code of the Philippines
NSCR	North South Commuter Railway
NSRP-South	North South Railway Project –South Line (Commuter)
NTC	Philippine National Telecommunication Commission
O&M	Operation and Maintenance
OCC	Operation Control Center
OCS	Overhead Contact line System
ODA	Official Development Assistance
OFC	Optical Fiber Cable
OIM	Outline Interface Matrix
OJT	On the Job Training
OSR(S)	Operational Safety Report (Software)
PC	Particular Conditions of Contract
PEC	Philippines Electrical Code
PH	Philippines

Abbreviation	Description
PNFC	Philippines National Fire Code
PNR	Philippine National Railway
PR	Public Relations
PSD	Platform Screen Door
PT	Potential Transformer
RAM	Reliability, Availability, Maintainability
RAMS	Reliability, Availability, Maintainability, and Safety
RSR	Technical Regulatory Standards on Japanese Railways and including explanation
RTU	Remote Terminal Unit
SAMP	System Assurance Management Plan
SCADA	Supervisory Control and Data Acquisition
SER	Station Equipment Room
SS	Substation
STRASYA	Standard urban Railway System for Asia
SPD	Surge Protection Device
SWO	Stop Work Order
TOC	Taking Over Certificate
TSS	Traction Substation
UIC	International Union of Railway Standards
UPS	Uninterruptible Power Supply
VLAN	Virtual LAN
VT	Voltage Transformer
XLPE	Cross-linked polyethylene

APPENDIX 2- PROGRAM

2.1 Time Scaled Network/ Bar Chart

- 2.1.1 The coding structure shall be such that the activities can be summarized to the various levels. The Contractor shall comply with the Employer's Work Breakdown Structure (WBS), Activity codes, Activity ID, etc. Refer to the Tables shown in this Appendix for the detail on WBS and Activity Codes. The Contractor can propose further breakdown and additional codes for project use upon the review and approval by the Employer or the Engineer. Each activity in the network shall be coded, as a minimum, with the following:
- (1) Contract number, activity type, and unique identification numbers,
 - (2) Activity codes to indicate Unit, Segment, Stage or Phase, for e.g., design, manufacturing, delivery, installation, etc., and
 - (3) The Contractor shall note that the breakdown of the system into sub-systems is essential and shall be carried out not through further coding but activity descriptions in a consistent manner.
 - (4) For more details, the Contractor can refer to the Employer's Planning and Schedule Manual.
- 2.1.2 All logical and necessary relationships between activities shall be shown.
- 2.1.3 All key dates (if any) indicated in the Contract shall be shown. In addition to the key dates, the Contractor may require certain events that are critical to his work to be reflected in his programs as "milestones".
- 2.1.4 All the activities shall be loaded with associated costs in accordance with the Accepted Contract Amount (ACA) and Bill of Quantity (BOQ). An S-Curve should be generated accordingly to demonstrate the physical progress throughout the project period. A cashflow shall be prepared based on the forecast progress and contract terms & conditions.
- 2.1.5 If payment milestones are applicable for the contract, all the payment milestones shall be created and allocated with the agreed amount. A cashflow shall be generated accordingly.
- 2.1.6 The level of program development, information, and detail shall be sufficient to permit the Engineer to have a good appreciation of the Contractor's project management plan especially with regard to the coordination and timing of his work in relation to the work of the Interface Contractors and the obtaining of necessary approvals from the relevant local authorities. It shall demonstrate the ability to meet specified key dates through a logical work sequence that has taken account of the Project constraints.
- 2.1.7 Activities pertaining to review/acceptance by the Engineer and local authorities shall be identified. Where duration for review of the Contractor's submissions are specified elsewhere in the Contract, they shall be used.
- 2.1.8 Activities outside the scope of the Contract that may affect the Contractor's progress shall be shown.
- 2.1.9 The activity network shall be organized so that major work sections are carefully coordinated with Interface Contractors to allow opportunity for all to work with as minimal disruption as possible. Critical paths shall be identified.
- 2.1.10 Activity descriptions shall be brief and shall convey the nature and scope of the work. Uncommon abbreviations shall be explained in the legend. Float time shall be distinguished from schedule performance.

- 2.1.11 The CPM Network Diagram shall be developed to permit modification to the schedule and allows for impacts on the schedule to be analyzed by the introduction of "what if" statements into the input data.
- 2.1.12 The constraint shall be applied to only the Key Dates and Access Dates for calculating the floats. All the schedule assumptions shall be described and schedule lag shall be explained in the narrative.

2.2 Time Scaled Network/Bar Chart Details

- 2.2.1 Mobilization: The mobilization network/bar chart shall include key personnel, major team, major subcontractors, and setup of office, camp, plant & equipment, as well as the early procurement for long lead time items. In general, those activities shall be carried out within the first 120 days after the commencement of works, but not specific to the following phases.
- 2.2.2 Design: The design network/bar chart shall detail the various design, submission, and acceptance stages including approval by local authorities (if any) and Approval from the Engineer, preparation, submission, and Approval of drawings manuals and all other activities related to the design.
- 2.2.3 Manufacturing: The manufacturing network chart shall indicate the relationship and duration of the activities necessary to procure, fabricate, manufacture assemble equipment/complete car tests, ship, and deliver rolling stock in time to support the activities at the Site. It shall establish milestones for monitoring the progress of the manufacturing process. The network shall also cover activities of the Subcontractor as appropriate, including testing.
- 2.2.4 Construction and Installation: The on-site construction and installation activities shall detail the relationship and duration of the activities required for preparing, constructing, erecting, cabling all the Civil, MEP Trackwork, System works in the final location as per the drawings. The interface should be identified if multiple contractors have to carry out their works in parallel / in a specific sequence at the same site throughout a period. Certain intermediate milestones could be added to monitor and measure the key achievement.
- 2.2.5 Testing, commissioning, and acceptance: The factory and on-site testing and commissioning activities shall present the relationship and duration of those items relating to commissioning tests including those related to the Interface Contractors. The network/bar chart shall present the testing approach and sequence to be used, the deployment of resources in accordance with signaling milestone dates.
- 2.2.6 Integrated testing: The integrated testing network/bar chart shall indicate the activities required to verify the functioning of all subsystems and the rolling stock in conjunction with activities of the Interface Contractors.
- 2.2.7 Trial Runs: After completion of commissioning, the Contractor shall be required to take part in trial runs with other interface contractors as decided. The network/chart shall indicate tests, measurements, and interface tests required to be carried out to verify system performance and readiness for revenue service.

2.3 Program Standards

- 2.3.1 All the programs shall be prepared, monitored, updated, and revised based on good project planning, scheduling, and monitoring practices as accepted internationally, and under the guidance of ISO 21500 – 2012.

Table D - 1: DOTr Primavera Cloud – Schedule Work Breakdown Structure (WBS) Page 1 of 2

DOTr Primavera Cloud - Schedule Work Breakdown Structure (WBS)

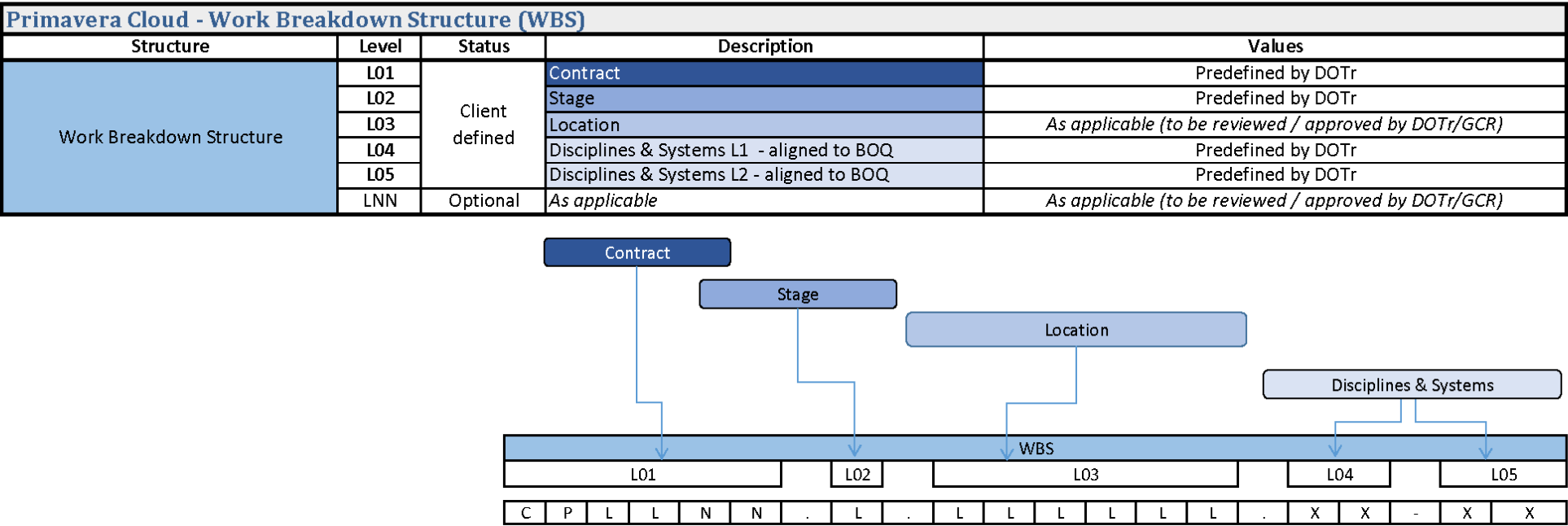


Table D - 2: DOTr Primavera Cloud – Schedule Work Breakdown Structure (WBS) Page 2 of 2

DOTr Primavera Cloud - Schedule Work Breakdown Structure (WBS)

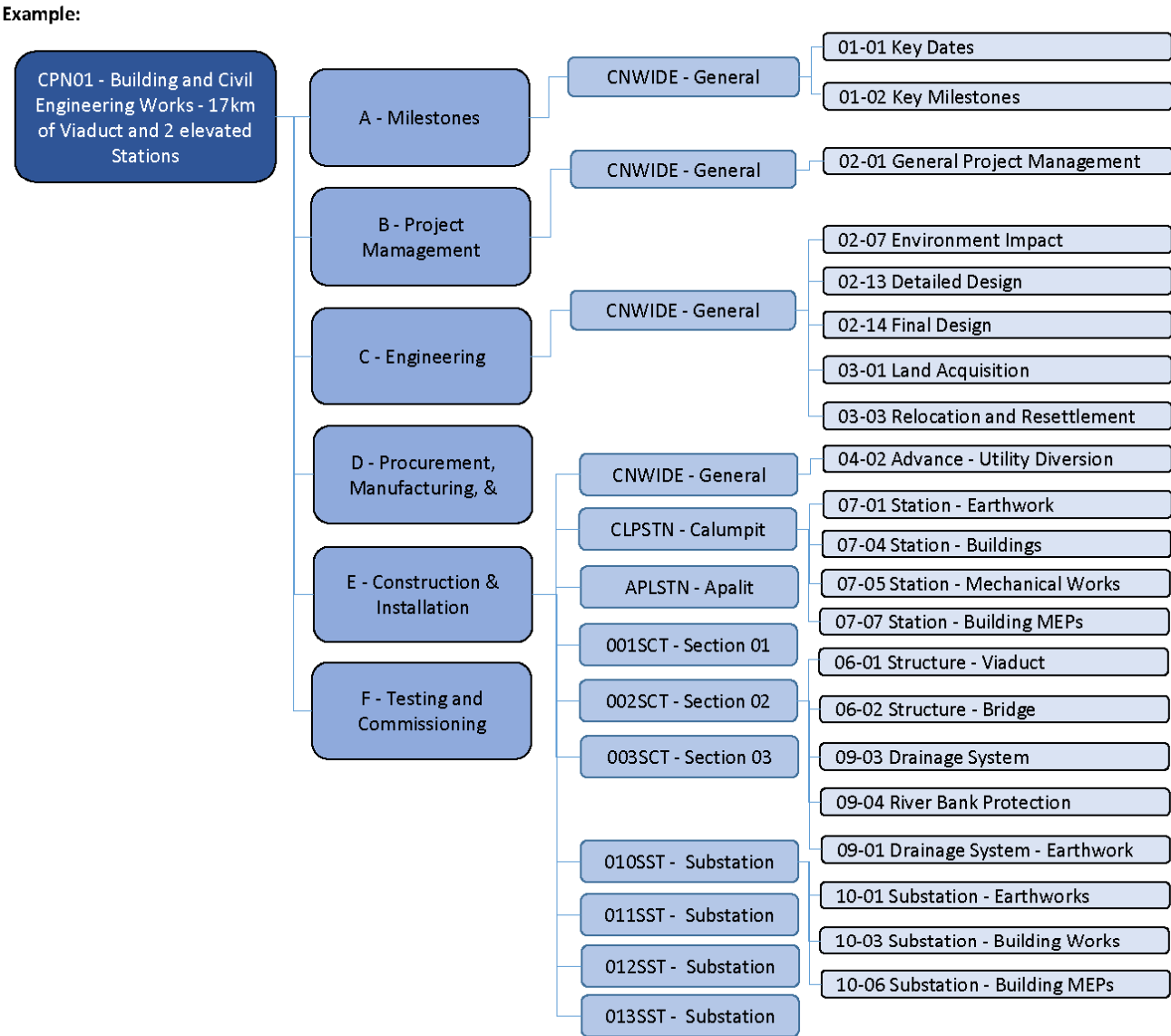


Table D - 3: DOTr Primavera Cloud – Schedule WBS Dictionary Page 1 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

Work Breakdown Structure (WBS) Dictionary (Level 1 to Level 5)

WBS Level 1 - Contract						
C	P	L	L	N	N	Description
C	P		O	0	1	Building and Civil Engineering Works
C	P		O	0	2	Building and Civil Engineering Works
C	P		O	0	3	Rolling Stock - Commuter Trainsets
C	P		O	0	4	E&M Systems and Track Works
C	P		O	0	5	Building and Civil Engineering Works
C	P		N	0	1	Building and Civil Engineering Works - 17km of Viaduct and 2 elevated Stations
C	P		N	0	2	Building and Civil Engineering Works - 16km of Viaduct and 1 elevated Stations
C	P		N	0	3	Building and Civil Engineering Works - 16km of Viaduct and 2 elevated Stations
C	P		N	0	4	Building and Civil Engineering Works - 6.5km of mainline and 1.1km depot access line, 1 U
C	P		N	0	5	Building and Civil Engineering Works - Depot (approx. 33ha)
C	P		S	0	1	Building and Civil Engineering Works - 1.1 km of Viaduct and 1 Elevated Station
C	P		S	0	2	Building and Civil Engineering Works - 7.9 km of Viaduct and 3 Elevated Station
C	P		S	3	a	Building and Civil Engineering Works - 4.5 km of Viaduct, Atgrade, 1 atgrade Station and 1
C	P		S	3	b	Building and Civil Engineering Works - 10.7 km of Viaduct, Atgrade, 1 semi U/G, 1 atgrade
C	P		S	0	4	Building and Civil Engineering Works - 8.5 km of Viaduct and 2 Elevated Station
C	P		S	0	5	Building and Civil Engineering Works - 12.8 km of Viaduct and 3 Elevated Stations
C	P		S	0	6	Building and Civil Engineering Works - 10.3 km of Viaduct and 3 Elevated Stations
C	P		S	0	7	Building and Civil Engineering Works - Depot (Approx. 20ha)
C	P	N	S	0	1	E&M Systems and Track Works including PSD at all NSCR stations
C	P	N	S	0	2	Rolling Stock-Commuter Trainsets (38 trainsets consisting of 8 cars, total 304 cars)
C	P	N	S	0	3	Rolling Stock-Limited Express Trainsets (7 trainsets consisting of 8 cars, total 56 cars)
To be added when new contract is initiated						
WBS Level 2 - Stage (EPC/D&B phases)						
					L	Description
					A	Milestones
					B	Project Management
					C	Engineering (Concept, Preliminary, Detailed, Final, ICD, NOC etc)
					D	Contract & Procurement (including manufacturing & delivery)
					E	Construction & Installation

Remarks

Remarks

Table D - 4: DOTr Primavera Cloud – Schedule WBS Dictionary Page 2 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C P L L N N						Description	Remarks
					F	Testing & Commissioning (static, interface, dynamic, integration, Trial Operation)	
					G	Operation & Maintenance	
WBS Level 3 - Location / Section / Construction Front							
L L L L L L						Description	Remarks
						Pre-defined by DOTr	
P	R	W	I	D	E	Program Wide	
N	1	W	I	D	E	N1 Wide	
N	2	W	I	D	E	N2 Wide	
S	C	W	I	D	E	SC Wide	
C	N	W	I	D	E	General (Contract Wide)	
A	L	A	S	T	N	Station - Alabang	
A	N	G	S	T	N	Station - Angeles	
A	P	L	S	T	N	Station - Apalit	
B	A	L	S	T	N	Station - Balagtas	
B	A	N	S	T	N	Station - Banlic	
B	C	T	S	T	N	Station - Bicutan	
B	I	N	S	T	N	Station - Binan	
B	L	U	S	T	N	Station - Blumentritt	
B	O	C	S	T	N	Station - Bocaue	
B	C	L	S	T	N	Station - Bucal	
B	U	E	S	T	N	Station - Buendia	
C	B	Y	S	T	N	Station - Cabuyao	
C	M	B	S	T	N	Station - Calamba	
C	A	L	S	T	N	Station - Caloocan	
C	L	P	S	T	N	Station - Calumpit	
C	R	K	S	T	N	Station - Clark	
C	I	A	S	T	N	Station - Clark International Airport	
E	D	S	S	T	N	Station - EDSA	
E	S	P	S	T	N	Station - Espana	
F	T	I	S	T	N	Station - FTI	
G	U	I	S	T	N	Station - Guiguinto	
M	A	B	S	T	N	Station - Mabalacat	
M	L	B	S	T	N	Station - Malabon	
M	A	L	S	T	N	Station - Malolos	
M	L	S	S	T	N	Station - Malolos South	
M	A	R	S	T	N	Station - Marilao	
M	E	Y	S	T	N	Station - Meycauayan	
M	T	N	S	T	N	Station - Muntinlupa	
N	C	1	S	T	N	Station - New Clark City 1	
N	C	2	S	T	N	Station - New Clark City 2	

DOTr Primavera Cloud - Schedule WBS Dictionary

Page 3 of 7

Table D - 6: DOTr Primavera Cloud – Schedule WBS Dictionary Page 4 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	N	N	Description	Remarks
N	N	-	N	N	Description	Remarks
0	1				Project Key Dates & Milestones	
0	1	-	0	1	Key Dates	
0	1	-	0	2	Key Milestones	
0	1	-	0	3	Payment Milestones	
0	1	-	0	4	Other Milestones (Interface/Intermediate/not defined in the contract)	
0	2				General and Consultancy Services	
0	2	-	0	1	General Project Management (General Requirements)	Level 5 is aligned to General Requirement in BOQ
0	2	-	0	2	Data Collection & Concept Design	Level 6
0	2	-	0	3	Geotechnical	Suggest to be aligned to the further breakdown (As per GS No.) in BOQ
0	2	-	0	4	Land Based Survey	GS No. Description - some examples below
0	2	-	0	5	Aerial Survey	103 Possession of Site and Contractors Mobilization
0	2	-	0	6	Business Modeling	104 Contractor's Temporary Facilities
0	2	-	0	7	Environment Impact Assessment	105 Project Information Sign Boards
0	2	-	0	8	Material Testing	106 Laboratory
0	2	-	0	9	Interface coordination and management	107 Contractor's Project Organization and Management
0	2	-	1	0	Specialist Design Consultancies	108 Site Office for the Employer and the Engineer
0	2	-	1	1	Safety, Risk, Security, RAMS Services	110 Detailed Works Programme
0	2	-	1	2	Preliminary Engineering	112 Surveying, Setting out of the Works and Staking
0	2	-	1	3	Detailed Design and Engineering	114 Traffic Management
0	2	-	1	4	Final Design and Shop Drawings	118 Environmental Management
0	2	-	1	5	Legal Services	119 Document and Drawing Submittals and Reviews
0	2	-	1	6	Meteorology & Seismology (incl Weather & Climate) Services	120 Submission and Response Procedure
0	3				RAP (Resettlement Action Plan)	121 Operating and Maintenance Manuals and Documents
0	3	-	0	1	Land Acquisition (Paper works for utility relocation and tree permits)	122 Construction Photographs
0	3	-	0	2	LRIP (Likelihood Restoration and Improvement Program)	123 Video Recordings
0	3	-	0	3	Relocation and Resettlement (proeject affected people)	130 Securities and Insurance
0	3	-	0	4	GRM (Grievances Redress Mechanism)	
0	4				Advance & Enabling Works	
0	4	-	0	1	Demolition	
0	4	-	0	2	Utility Diversion (or Protection)	
0	4	-	0	3	Relocation of Existing Facilities	
0	5				Earthworks	
0	5	-	0	1	Earthworks	
0	5	-	0	2	Maintenance Road/Access Road	
0	5	-	0	3	Existing Road Realignment	
0	5	-	0	4	Swampy Section	
0	5	-	0	5	Subbase and Base Course	
0	5	-	0	6	Surface Course	

refer to N-01 to N-05 BOQ

Table D - 7: DOTr Primavera Cloud – Schedule WBS Dictionary Page 5 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
	0	5	-	0	7	Structural Works	
	0	5	-	0	8	Miscellaneous Structures	
	0	5	-	0	9	Plumbing and Sanitary Works	
	0	6				Railway Structures	Level 6
	0	6	-	0	1	Viaduct	Suggest to be aligned to the further breakdown in BOQ
	0	6	-	0	2	Bridges (Underbridge, Overbridge, etc)	Earthwork
	0	6	-	0	3	Underground Structures (Cut & Cover Tunnel, Bored Tunnel, Underpass etc)	Sub Structural and Superstructural Works
	0	6	-	0	4	At Grade Structure	Drainage Works (In Viaduct)
	0	6	-	0	5	Utility Corridor	Miscellaneous Works
	0	6	-	0	6	Box Culvert	
	0	7				Stations (including SIG/COM/Railway Electric house)	Level 6
	0	7	-	0	1	Earthworks	Suggest to be aligned to the further breakdown in BOQ
	0	7	-	0	2	Subbase and Base Course	
	0	7	-	0	3	Surface Course	
	0	7	-	0	4	Building Works	
	0	7	-	0	5	Mechanical Works	
	0	7	-	0	6	Miscellaneous Works	
	0	7	-	0	7	Building MEPs	
	0	7	-	0	8	Exterior Works / Related Facilities	
	0	8				Depots	Level 6
	0	8	-	0	1	Major Buildings (OCC, WS & LRS)	Suggest to be aligned to each building in BOQ
	0	8	-	0	2	Small Buildings	Level 7
	0	8	-	0	3	Training Center	Suggest to be aligned to the further breakdown in BOQ
	0	8	-	0	4	Landscape	
	0	9				Drainage System & River Bank Protection	
	0	9	-	0	1	Earthworks	
	0	9	-	0	2	Structural Works	
	0	9	-	0	3	Drainage Works	
	0	9	-	0	4	River Bank Protection Works	
	0	9	-	0	5	SAPANG BALEN River Plan (N-03)	
	0	9	-	0	6	Pump System for Underground and Gil Puyat Underpass (N-04)	
	0	9	-	0	7	Drain System for Detention Basin 1 & 2 (N-05)	
	1	0				Substations	
	1	0	-	0	1	Earthworks	
	1	0	-	0	2	Subbase and Base Course	
	1	0	-	0	3	Building Works	
	1	0	-	0	4	Mechanical Works	
	1	0	-	0	5	Miscellaneous Works	

Table D - 8: DOTr Primavera Cloud – Schedule WBS Dictionary Page 6 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
	1	0	-	0	6	Building MEPs	
	1	0	-	0	7	Exterior Works / Related Facilities	
	1	1				Trackwork	
	1	1	-	0	1	Plain Line Track (Slab, ballast, etc)	
	1	1	-	0	2	Switches & Crossing	
	1	2				Railway Systems	
	1	2	-	0	1	Signal and Train Control System	NS01, NS02, NS03 are based on Payment Milestones (very high level in BOQ. to be subdivided by contractors)
	1	2	-	0	2	Telecommunications System	
	1	2	-	0	3	Power Supply System	
	1	2	-	0	4	Power Distribution System	
	1	2	-	0	5	Overhead Catenary System (Overhead Contact line)	
	1	2	-	0	6	SCADA	
	1	2	-	0	7	Operation Control Center (OCC) System	
	1	2	-	0	8	Platform Screen Door System	
	1	2	-	0	9	Automatic Fare Collection System	
	1	2	-	1	0	Depot Equipments (Facility)	
	1	2	-	1	1	Training Facilities	
	1	2	-	1	2	Fire System	
	1	2	-	1	3	Asset Protection System	
	1	2	-	1	4	Maintenance Management Information System	
	1	2	-	1	5	Building Management System	
	1	3				Client Procured Materials	
	1	3	-	0	1	Rail	
	1	3	-	0	2	Ballast	
	1	3	-	0	3	Sleepers	
	1	3	-	0	4	Fasteners	
	1	3	-	0	5	Switches & Crossings	
	1	4				Rolling Stock & Maintenance Vehicles	
	1	4	-	0	1	Passenger Trainsets - Commuter	
	1	4	-	0	2	Passenger Trainsets - Limited Express	
	1	4	-	0	3	Maintenance Vehicles	
	1	4	-	0	4	Freight Trainsets	
	1	5				T&C and Handover	
	1	5	-	0	1	Testing & Commissioning (Static Test, Dynamic Tests, Integration Test, SODT)	
	1	5	-	0	2	Training	
	1	5	-	0	3	Final Documentation (as built drawing, manuals, etc)	
	1	5	-	0	4	Spare Parts/Special Tools	

Table D - 9: DOTr Primavera Cloud – Schedule WBS Dictionary Page 7 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
1	6					Operation Readiness & Trial Run	
1	6	-	0	1		Early Phase (Policies, Plans, mobilization)	
1	6	-	0	2		O&M Management & Support Services (Management systms & tools, IT, procurement, D&B documentation, OHSSE, stakeholders management, PMO, etc)	
1	6	-	0	3		Deployment phase (Procedures and rule books, recruiting & training, fitout, etc)	
1	6	-	0	4		Trial Run & Certification	
1	7					Provisional Sum / Dayworks	

Table D - 10: Activity Codes Page 1 of 1

Activity Code			
DOTr NSCR - P6 Activity Code			
DOTr01 - Project Group		DOTr05 - Subsystem/SubGroup	
Code Value	Description	Code Value	Description
PW	Project Wide	001	Project/Contract Wide
N1	NSCR (Metro Manila to Malolos)	002	Professional and Technical Services
N2	MCRP (Malolos to Clark International Airport)	003	Resettlement Action Plan related
SC	NSRP - South (Metro Manila to Calamba)	004	AD-Demolition
DOTr02 - Sub-Phase		005	AD-Utility Diversion (or Protection)
Code Value	Description	006	AD-Relocation of Existing Facilities
KD	Key Date	007	EW-Earthworks
AD	Access Dates	008	EW-Maintenance Road/Access Road
KM	Key Milestones	009	EW-Existing Road Realignment
IM	Interface Milestones	010	EW-Swampy Section
MB	Mobilization (Staff/Office/Camp/Facility)	011	EW-Subbase and Base Course
PP	Management Plan and Procedures	012	EW-Surface Course
MR	Meetings and Reporting	013	EW-Structural Works
PM	Other Project Management	014	EW-Miscellaneous Structures
LA	Land Acquisition (RAP) related	015	EW-Plumbing and Sanitary Works
SV	Survey & Study (data collection)	016	STR-Viaduct
CD	Concept Design / System Design	017	STR-Bridges (Underbridge, Overbridge, etc)
PD	Preliminary Design / FEED	018	STR-Underground Structures (Cut & Cover Tunnel, Bored Tunnel, Underpass etc)
DD	Detail Design	019	STR-At Grade Structure
FD	Final Design (Shop Drawings)	020	STR-Utility Corridor
SW	Software Design & Development	021	STR-Box Culvert
IC	Interface Coordination Drawings	022	STN-Earthworks
PR	Procurement	023	STN-Subbase and Base Course
MF	Manufacturing & Fabrication (including TT, FAI, FAT)	024	STN-Surface Course
TD	Delivery to Site (Overseas & Domestic)	025	STN-Building Works
TE	Construction Temporary facilities	026	STN-Mechanical Works
AW	Advance works / Enabling works	027	STN-Miscellaneous Works
YN	Construction Installation	028	STN-Building MEPs
PI	Post Installation Check-out Test	029	STN-Exterior Works / Related Facilities
ST	Static Test	030	DPT-Major Buildings (OCC, WS & LRS)
DY	Dynamic Test	031	DPT-Small Buildings
SI	System Integrated Test	032	DPT-Training Center
TO	Trial Operation, Trial Running	033	DPT-Landscape
CA	Certification & Authority Approval	034	DSRB-Earthworks
TR	Training (including plans and manuals)	035	DSRB-Structural Works
OM	O&M related (Operation Readiness)	036	DSRB-Drainage Works
HO	Handover - Documentation/Spare parts/Special tools	037	DSRB-River Bank Protection Works
DM	Demobilization / Site Rehabilitation	038	DSRB-SAPANG BALEN River Plan (N-03)
DOTr03 - Responsibility		039	DSRB-Pump System for Underground and Gil Puyat Underpass (N-04)
Code Value	Description	040	DSRB-Drain System for Detention Basin 1 & 2 (N-05)
DOT	DOTr	041	SST-Earthworks
NST	NSTren	042	SST-Subbase and Base Course
ARP	Arup	043	SST-Building Works
GCR	GCR	044	SST-Mechanical Works
CON	Contractors	045	SST-Miscellaneous Works
PNR	PNR	046	SST-Building MEPs
NHA	NHA	047	SST-Exterior Works / Related Facilities
SFH	SFHC	048	TW-Plain Line Track (Slab, ballast, etc)
DOTr04 - Land Acquisition (Specific)		049	TW-Switches & Crossing
Code Value	Description	050	SYS-Signal and Train Control System
FSS	Feasibility Study Surveys	051	SYS-Telecommunications System
DDS	DED Surveys	052	SYS-Power Supply System
LSV	Land and Structure Validation	053	SYS-Power Distribution System
NOT	Notice of Taking	054	SYS-Overhead Catenary System (Overhead Contact line)
APP	Appraisal	055	SYS-SCADA
OTB	Offer to Buy	056	SYS-Operation Control Center (OCC) System
EXP	Expropriation	057	SYS-Platform Screen Door System
PYP	Payment Processing	058	SYS-Automatic Fare Collection System
TOT	Transfer of Title	059	SYS-Depot Equipments (Facility)
PTE	Permit to Enter	060	SYS-Training Facilities
TCU	DENR Tree Cutting	061	SYS-Fire System
PCL	PROW Clearing (PAPs' structures)	062	SYS-Asset Protection System
NA	Not Applicable	063	SYS-Maintenance Management Information System
		064	SYS-Building Management System
		065	PRC-Rail
		066	PRC-Ballast
		067	PRC-Sleepers
		068	PRC-Fasteners
		069	PRC-Switches & Crossings
		070	RS-Passenger Trainsets - Commuter
		071	RS-Passenger Trainsets - Limited Express
		072	RS-Maintenance Vehicles
		073	RS-Freight Trainsets
		074	HO-Testing & Commissioning (Static Test, Dynamic Tests, Integration Test, SODT)
		075	HO-Training
		076	HO-Final Documentation (as built drawing, manuals, etc)
		077	HO-Spare Parts/Special Tools
		078	OPR-Early Phase (Policies, Plans, mobilization)
		079	OPR-O&M Management & Support Services (Management systms & tools, IT, procurement, D&B documentation, OHSSE, stakeholders management, PMO, etc)
		080	OPR-Deployment phase (Procedures and rule books, recruiting & training, fitout, etc)
		081	OPR-Trial Run & Certification
		082	Provisional (others)
		DOTr06 - Sub-Location	
		Code Value	Description
		PRW000	Project/Contract Wide
		STN001	Station - Alabang
		STN002	Station - Angeles
		STN003	Station - Apalit
		STN004	Station - Balagtas
		STN005	Station - Banlic
		STN006	Station - Bicutan
		STN007	Station - Binan
		STN008	Station - Blumentritt
		STN009	Station - Bocaue
		STN010	Station - Bucal
		STN011	Station - Buendia
		STN012	Station - Cabuyao
		STN013	Station - Calamba
		STN014	Station - Caloocan
		STN015	Station - Calumpit
		STN016	Station - Clark
		STN017	Station - Clark International Airport
		STN018	Station - EDSA
		STN019	Station - Espana
		STN020	Station - FTI
		STN021	Station - Guiguinto
		STN022	Station - Mabalacat
		STN023	Station - Malabon
		STN024	Station - Malolos
		STN025	Station - Malolos South
		STN026	Station - Marilao
		STN027	Station - Meycauayan
		STN028	Station - Muntinlupa
		STN029	Station - New Clark City 1
		STN030	Station - New Clark City 2
		STN031	Station - New Clark City 3
		STN032	Station - Nichols
		STN033	Station - Pacita
		STN034	Station - Paco
		STN035	Station - San Fernando
		STN036	Station - San Pedro
		STN037	Station - Santa Mesa
		STN038	Station - Santa Rosa
		STN039	Station - Santo Tomas
		STN040	Station - Sindalan
		STN041	Station - Soils
		STN042	Station - Surat
		STN043	Station - Tabing Ilog
		STN044	Station - Tuktukan
		STN045	Station - Tutuban
		STN046	Station - Valenzuela
		STN047	Station - Valenzuela Polo
		SSTN01	Substation - N1-01
		SSTN02	Substation - N1-02
		SSTN03	Substation - N1-03
		SSTN04	Substation - N1-04
		SSTN05	Substation - N1-05
		SSTN06	Substation - N1-06
		SSTN07	Substation - N1-07
		SSTN08	Substation - N1-08
		SSTN09	Substation - N1-09
		SSTN10	Substation - N2-10
		SSTN11	Substation - N2-11
		SSTN12	Substation - N2-12
		SSTN13	Substation - N2-13
		SSTN14	Substation - N2-14
		SSTN15	Substation - N2-15
		SSTN16	Substation - N2-16
		SSTN17	Substation - N2-17
		SSTN18	Substation - N2-18
		SSTN19	Substation - N2-19
		SSTN20	Substation - N2-20
		SSTN21	Substation - N2-21
		SSTN22	Substation - N2-22
		SSTS01	Substation - S-01
		SSTS02	Substation - S-02
		SSTS03	Substation - S-03
		SSTS04	Substation - S-04
		SSTS05	Substation - S-05
		SSTS06	Substation - S-06
		SSTS07	Substation - S-07
		SSTS08	Substation - S-08
		SSTS09	Substation - S-09
		SSTS10	Substation - S-10
		SSTS11	Substation - S-11
		SSTS12	Substation - S-12
		SSTS13	Substation - S-13
		SSTS14	Substation - S-14
		SSTS15	Substation - S-15
		SSTS16	Substation - S-16
		SSTS17	Substation - S-17
		SSTS18	Substation - S-18
		SSTD01	Substation - N1 Depot
		SSTD02	Substation - N2 CIA Depot
		SSTD03	Substation - SC Banlic Depot
		DPT001	Depot - Calamba
		DPT002	Depot - Clark
		DPT003	Depot - Malanday, Valenzuela

Table D - 11: DOTr Primavera – Schedule Activity ID Numbering System Page 1 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

Activity ID : ACTIVITY ID NUMBERING SYSTEM

Following section is extracted from Planning and Schedule Manual

All Project Schedules are developed by using Primavera P6 software. It defines each Design, Manufacturing, Installation and Testing activity for different sections and stages. It also establishes the sequence and logic between the activities. This section will explain the principles for Activity ID Numbering System.

In Primavera P6, it is allowed to have 20 digits for Activity ID. However, it is not easy to remember or recognize if the Activity ID is too long and complicate. Therefore, we consider using only 13 digits for Activity ID and group them into 4 blocks. The details of the 4 blocks coding structures will be explained as below:

Block 1	Block 2	Block 3	Block 4
OBS / Contract	PBS Code	ABS Code	ID Number
LLNN	LLL	LL	NNNN

Block 1 contains first to forth digit of the Activity ID and they represent OBS Code (Contract Number). Excluding first 2 letters (CP) of contract number, it comprises rest two letters (LL) and two numbers (NN).

Block 1
OBS / Contract
LLNN

Contract Number	SUBP Description
N01	Building and Civil Engineering Works - 17km of Viaduct and 2 elevated Stations
N02	Building and Civil Engineering Works - 16km of Viaduct and 1 elevated Stations
N03	Building and Civil Engineering Works - 16km of Viaduct and 2 elevated Stations
N04	Building and Civil Engineering Works - 6.5km of mainline and 1.1km depot access line, 1 U/G Stations
N05	Building and Civil Engineering Works - Depot (approx. 33ha)
S01	Building and Civil Engineering Works - 1.1 km of Viaduct and 1 Elevated Station
S02	Building and Civil Engineering Works - 7.9 km of Viaduct and 3 Elevated Station
S3a	Building and Civil Engineering Works - 4.5 km of Viaduct, Atgrade, 1 atgrade Station and 1 Elevated Station
S3b	Building and Civil Engineering Works - 10.7 km of Viaduct, Atgrade, 1 semi U/G, 1 atgrade, and 2 Elevated Stations
S04	Building and Civil Engineering Works - 8.5 km of Viaduct and 2 Elevated Station
S05	Building and Civil Engineering Works - 12.8 km of Viaduct and 3 Elevated Stations
S06	Building and Civil Engineering Works - 10.3 km of Viaduct and 3 Elevated Stations
S07	Building and Civil Engineering Works - Depot (Approx. 20ha)
NS01	E&M Systems and Track Works including PSD at all NSCR stations
NS02	Rolling Stock-Commuter Trainsets (38 trainsets consisting of 8 cars, total 304 cars)

Block 2 contains the fifth to seventh digit of the Activity ID and they represent Product Breakdown Structure code (PBS). In principle, it should align to client's WBS Level 4. However, with discussion and approval from the Client/GCR, it could be further broken down and added with new items as per scope of work.

Block 2
PBS Code
LLL

Subgroup	Description
GEN	General and Consultancy Services
RAP	RAP (Resettlement Action Plan)
ADW	Advance & Enabling Works
EWS	Earthworks
STR	Railway Structures
STN	Stations (including SIG/COM/Railway Electric house)
DPT	Depots
DRB	Drainage System & River Bank Protection

Table D - 12: DOTr Primavera Cloud – Schedule Activity ID Numbering System Page 2 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

SST	Substations
TWK	Trackwork
SYS	Railway Systems
PRC	Client Procured Materials
RSV	Rolling Stock & Maintenance Vehicles
THO	T&C and Handover
OPR	Operation Readiness & Trial Run
PRS	Provisional Sum / Dayworks

Block 3 contains the eighth and ninth digit of the Activity ID and they represent Activity Breakdown Structure code (ABS). It consists of 2 letters (LL). Their details are listed below:

Block 3
ABS Code
LL

ABS	ABS Description
KD	Key Date
AD	Access Dates
KM	Key Milestones
IM	Interface Milestones
MB	Mobilization (Staff/Office/Camp/Facility)
PP	Management Plan and Procedures
MR	Meetings and Reporting
PM	Other Project Management
LA	Land Acquisition (RAP) related
SV	Survey & Study (data collection)
CD	Concept Design / System Design
PD	Preliminary Design / FEED
DD	Detail Design
FD	Final Design (Shop Drawings)
SW	Software Design & Development
IC	Interface Coordination Drawings
PR	Procurement
MF	Manufacturing & Fabrication (including TT, FAI, FAT)
TD	Delivery to Site (Overseas & Domestic)
TE	Construction Temporary facilities
AW	Advance works / Enabling works
YN	Construction Installation
PI	Post Installation Check-out Test
ST	Static Test
DY	Dynamic Test
SI	System Integrated Test
TO	Trial Operation, Trial Running
CA	Certification & Authority Approval
TR	Training (including plans and manuals)
OM	O&M related (Operation Readiness)
HO	Handover - Documentation/Spare parts/Special tools
DM	Demobilization / Site Rehabilitation

Block 4 contains the tenth to thirteenth digit of the Activity ID and they represent the ID number ranging from 0000 to 9999.

Table D - 13: DOTr Primavera Cloud – Schedule Activity ID Numbering System Page 3 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

Block 4	
ID Number	
NNNN	

ID No.	ID No. Description
0	ID No. 0000
.....
9999	ID No. 9999

APPENDIX 3 - MONTHLY PROGRESS REPORTS

3.1 Submission

- 3.1.1 The Contractor shall submit to the Engineer, a Monthly Progress Report within 7 days after the last day of the period to which it relates. It shall be submitted in a format to which the Engineer shall have given his consent and shall contain sections/sub-sections for, but not be limited to, the topics listed below.

3.2 Financial Status

- 3.1.1 A summary sheet and narrative review of all significant financial matters, and actions proposed or taken with respect to any outstanding matters.
- 3.1.2 A spreadsheet summarizing each Cost Center, the budget, costs incurred during the period, costs to date, costs to go, cost forecast (total of costs to date and costs to go), and cost variance (difference between cost forecast and budget).
- 3.1.3 A spreadsheet indicating the status of all payments due and made.
- 3.1.4 List of Variations.
- 3.1.5 List of notice given under [Employer’s Claims and notices] given under [Contractor’s Claims] of the GC.
- 3.1.6 A report on the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.

3.2 Progress

- 3.2.1 Chart and detailed descriptions of progress, including each stage of design, Contractor’s documents, procurement, manufacture, delivery to site, installation, assembling, testing, commissioning, and trial operation.
- 3.2.2 Comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.
- 3.2.3 A simplified representation of progress is measured in percentage terms compared with percentage planned as derived from the Works Program.
- 3.2.4 Three Month Rolling Program, Time Chainage Program, and any other programs required by the Engineer.
- 3.2.5 Photographs and videos showing the status of manufacture and progress on the site.

3.3 Quality Assurance Reporting

- 3.4.1 Summarized report of quality assurance documents, test results, and certificates of materials. Two copies of these documents shall be submitted as a part of Quality Assurance reporting.

3.4 Milestones Status

- 3.4.1 A report on the status of all Milestones Items due to have been achieved during the month and forecasts of achievement of any missed Milestones, and those due in the next month.

3.5 Planning and Coordination

- 3.5.1 A summary of all planning/co-ordination activities during the month and details of outstanding actions.
- 3.5.2 A schedule of all submissions and consents/approvals obtained/outstanding.

3.6 Manufacturing progress reporting

- 3.6.1 Detailed description of all manufacturing achievements in the month including any problems encountered.
- 3.6.2 Material Control Schedule.
- 3.6.3 Summary of inspections and audits planned in the coming three months.
- 3.6.4 Summary of all issues raised during the inspections and audits that require closure.
- 3.6.5 For the manufacture of each main item of the Plant or component thereof, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (1) Commencement of manufacture,
 - (2) Contractor's inspection,
 - (3) Tests, and
 - (4) Shipment and arrival at the Site.

The percentage progress shall be in the form of actual v’s planned performance in respect of major equipment as required by the Engineer.

3.7 Contractor’s Personnel and Equipment and Employer's Equipment

- 3.7.1 Detail description of Records of Contractor’s Personnel and Equipment engaged.

3.8 Safety

- 3.8.1 Safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations and actions, proposed to prevent further occurrence.

3.9 Environment

- 3.9.1 A review of all the environmental issues during the past month to include all monitoring reports, mitigation measures undertaken, and activities to control environmental impacts.

3.10 Risk Management

- 3.10.1 A risk report shall be included within the Monthly Progress Report. The risk report shall describe the top five risks and issues, and risk management activities for the month. An appendix to the report shall include the contractors risk register printed from the Active Risk Manager (ARM), project risk database (listing all of the identified risks and issues) to be implemented by the Contractor, together with the risk detail sheet for each of the top five risks and issues.

3.11 Gender and Development

- 3.11.1 A summary of all recording, monitoring, investigation, and mitigation of all gender-based violence and sexual harassment-related cases committed by the Contractor’s and Sub-Contractors’ personnel to persons on and near the site.

APPENDIX 4 - SUBMITTALS REQUIRED

4.1. Submittals:

4.1.1. In accordance with the Employer’s Requirement-General Requirement, the Contractor shall submit, but not be limited to, the following plans within the time specified in the following Table.

Table 4-1: Submission of Plans

No.	Plan	To be submitted within	Sub-Section
1	Project Management Plan	15 days after the Commencement Date	4.2.2
2	Interface Management Plan	28 days after the Commencement Date	4.3.3
3	System Interface Plan	28 days after the Commencement Date	4.4.1
4	Detailed Time Program	28 days after the Commencement Date	4.5.2
5	Quality Assurance Management Plan	45 days after the Commencement Date	4.6.4
6	System Assurance Management Plan	45 days after the Commencement Date	4.7.1
7	System Safety Assurance Plan	45 days after the Commencement Date	20.2.1
8	Reliability, Availability and Maintainability Management Plan	90 days after the Commencement Date	20.3.1
9	Site Safety Management Plan	28 days after the Commencement Date	4.8.4
10	Software Quality Assurance Management Plan	90 days after the Commencement Date	4.9.1
11	Risk Management Plan	28 days after the Commencement Date	4.10.2
12	Environmental Management Plan (shall include Noise and Vibration Analysis Report)	60 days from the Commencement Date	4.11.1
13	Inspection, Testing, and Commissioning Management Plan	120 days after the Commencement Date	4.12.1 and 9.1.1
14	Earthing and Bonding Study Plan	28 days after the Commencement Date	4.13.1
15	Drawing and CAD Procedure	30 days after the Commencement Date	6.3.3

No.	Plan	To be submitted within	Sub-Section
16	Building Information Model (BIM) Execution Plan for LOD 100 to 500	30 days after the Commencement Date	6.3.4
17	Detailed Training Procedures	6 months prior to the Commencement of Training	14.8
18	Plan for Site Facilities	120 days after the Commencement Date	15.3.1
19	Traffic Control Plan	Before the start of Construction	16.2.8
20	Monthly Progress Reports	Monthly	4.16
21	Spare Parts Management Plan	not later than (12) months prior to the issue of the TOC for a System	4.21.2
22	Requirements Management Plan	30 days after the Commencement Date	21.3
23	Defects Notification Period Management Plan	Before handover	10.2.4
24	Method Statements	56 days prior to the start of construction	6.17
25	Operation and Maintenance Manuals	6 Months before handover	8.1
26	Project Document Control Procedure	28 days after the Commencement Date	7.2
27	Obsolescence Management Plan	within 90 days after commencement Date	22.11

APPENDIX 5 - QUALITY ASSURANCE REQUIREMENTS

5.1. Quality Assurance Management Plan

The Quality Assurance Management Plan shall define the Contractor's management structure and the quality management system for the execution of the Contract Works and shall, without limitation, define as follows:

- (1) The summary of the project requirements including all proposed quality activities;
- (2) All quality assurance and quality assurance procedures proposed by the Contractor for his use in the execution of the Works;
- (3) A list of all the codes of practice, standards, and specifications that the Contractor proposes to apply his work;
- (4) The Contractor’s organization-managerial staff, with particular reference to any member of a partnership, consortium or joint venture, and the main Subcontractors. Organization charts shall be produced to illustrate the subdivision of the Contract Works into elements for effective technical and managerial control, the reporting structure, and the relationship between all parties involved;
- (5) The appointment of a Quality Assurance Manager;
- (6) The specific allocations of responsibility and authority given to managerial and technical staff with particular reference to the design and Site supervision of the Contract Works;
- (7) The hierarchy and structure of the overall quality system documents to be applied to the Contracts, and clearly indicating any particular documents to be followed by individual key members of the Contractor if applicable;
- (8) The Contract specific quality procedures work instruction and/or standard forms, if applicable;
- (9) A full list of quality procedures works instructions, and/or standard forms, including any contract-specific documents, to be applied to the Contract. It shall be defined the specific ways to perform the related activities and the records to be generated as objective evidence of the activities performed or result achieved, and shall cover all the requirements of the Contract including, but not limited to, the following activities:
 - 1) The review, approval, and updating of the quality system documents to ensure their continuing suitability and effectiveness;
 - 2) Design control to all Permanent Works and/or Temporary Works, including design, works carried out by Subcontractors and sub-consultants. The procedures shall clearly define the review and verification;
 - 3) Drawing management in main office and site office(s), including production, approval, updating, maintaining, storage and distribution;
 - 4) Project document management, including registration, updating, indexing, filing, maintenance, storage, and distribution;
 - 5) Monitoring and control of Subcontractors with respect to program, submission, and quality of works;
 - 6) Monitoring of the submission and re-submission to the Engineer;

- 7) Monitoring of the ordering and delivery of materials, plant, and equipment;
- 8) Quality control of the Contract Works;
- 9) Quality audits on the Contractor and Subcontractors of any tiers; and
- 10) Establish and maintain a record in accordance with the Contract requirement provision.

The Quality Assurance Management Plan shall comprise of Management Quality Plan, Design Quality Plan, Manufacturing Quality Plan (including Inspection and Testing), and Testing and Commissioning (including Integrated Testing and Commissioning) Quality Plan.

5.1.1. Management Quality Plan

The Quality Management shall be implemented from the highest management level, and the Top Management of the Contractor JV shall bear overall responsibility for all Quality related matters and activities.

A Management Quality Plan shall be prepared with the organization chart having hierarchy and structure, responsibility and authority allocations, quality procedures, work instructions, and standard forms and recording. The Plan should also include sub-contractors and manufacturers.

An overall organization chart should be prepared that gives the management structure for the Project which is engaged in the design, procurement, management, transportation, construction, and installation. The organization will allow for on-site and off-site functions.

The Contractor's Organization Chart for this project explains the organization position and lines of reporting for the Quality Assurance Manager and any Quality Staff. The Management Quality Plan should discuss the authorities of the Quality Assurance Manager and Quality Staff. The Management Quality Plan should help to plan, assess, and improve the organization's quality system for the Project.

5.1.2. Design Quality Plan

The Contractor shall prepare a Design Quality Plan for any design works. The Design Quality Plan shall define the Contractor's and the Designer's policy for the design works and shall, without limitation, define:

- (1) The organization of the Contractor's and the Designer's design staff; Manufacturing Quality Plan, Testing and Commissioning Quality Plan,
- (2) The specific allocations of responsibilities and authorities given to identified design staff or Subcontractors for particular design works;
- (3) The hierarchy of quality management system documentation for managing and controlling design works, including design works of Subcontractors of any tier; and
- (4) The list of procedures and instructions to be applied to manage and control the quality of the design works.

5.1.3. Manufacturing Quality Plan

Manufacturing Quality Plan shall define the Contractor's management structure and quality management system for the manufacture of the key items of the Contract Works, and the items as requested by the Engineer. Separate Manufacturing Quality Plans shall be prepared for each item of the Contract Works.

The Contractor shall prepare and maintain a full list of all the Manufacturing Quality Plans required for the Contract with submission status and shall submit to the Engineer upon request.

Each Manufacturing Quality Plan shall define, without limitation:

- (1) The scope of works and the item covered by the plan;
- (2) The organization of the Contractor and/or the Subcontractor responsible for the day-to-day management of the manufacture of the item;
- (3) The specific allocations of responsibility and authority are given to personnel for the day-to-day management of the manufacturing activities with particular reference to the supervision, inspection, and testing of works; and
- (4) The specific methods of manufacture, including but not limited to the following:
 - 1) The particulars of the material to be incorporated into the items;
 - 2) The manufacturing process in compliance with drawings and specifications;
 - 3) The identification of referencing requirements for traceability of the manufactured items;
 - 4) The identification of the inspection and test status of the materials and final manufactured items;
 - 5) The disposition of nonconforming materials and manufactured items; and
 - 6) The handling, storage, packaging, preservation, and delivery of the manufactured items.

5.1.4. Inspection and Testing Plans

Under the Manufacturing Quality Plan, Inspection and Testing plans shall be produced for all activities requiring inspection and/or test.

The Contractor shall prepare and maintain a full list of all the inspection and Test Plans required for the Contract with submission status and review status and shall submit to the Engineer upon request.

Each Inspection and Test Plan shall define, without limitation:

- (1) The scope of activity covered by the plan;
- (2) The sequence of work related to the activity covered by the plan;
- (3) The personnel responsible for undertaking the inspection and/or test;
- (4) The personnel responsible for certifying the inspection and test;
- (5) The inspection and/or test method or a reference to the relevant standard of inspection and/or test;
- (6) The frequency of the inspection and/or test;
- (7) The compliance criteria of the inspection and/or test;
- (8) The Quality Hold Point and Quality Assurance Points;
- (9) The documents to be used for reporting the results of the inspection and/or test, and with examples of such documents incorporated into the Inspection and Test Plan; and
- (10) The storage locations and filing of the records of the inspection and/or test.

5.2. Quality Assurance Manager

The Contractor shall appoint a suitably qualified and experienced full-time person as the Quality Assurance Manager to be responsible for the task of establishing the documented quality management system and ensuring that the quality management system is implemented and maintained effectively.

The Quality Assurance Manager shall be directly responsible to the senior level of management and is able to discharge his duties without hindrance or constraint. In addition, the Contractor shall make available any such resources that are necessary to ensure the effective implementation of the quality management system.

The Contractor shall submit for review by the Engineer details of qualifications, experience, authority, and responsibility of the proposed Quality Assurance Manager, as part of the Quality Organization Plan.

5.2.1 Quality Audits

The Contractor shall carry out Quality Audits on the Contract Works at regular intervals, or at such other intervals as the Engineer may require, ensuring the continuing suitability and effectiveness of the quality management system. Reports of each such audit shall be submitted promptly to the Engineer for review.

The Contractor shall submit for review by the Engineer details of the authority, qualifications, and experience of personnel assigned to quality audit activities before carrying out quality audits.

The Engineer may require Quality Audits on the Contractor and his Subcontractors of any tier to be carried out by his representative or the Employer’s staff. In such a case, the Contractor shall afford to such auditors all necessary facilities and access to the activities and records to permit this function to be performed.

Upon receipt of Corrective Action Request (CAR) or similar document issued by the Engineer as a result of Quality Audits, the Contractor shall promptly investigate the matter and submit the proposed corrective and preventive actions within 14 days to the Engineer for review. The Contractor shall take timely corrective and preventive actions to rectify the matter and to prevent re-occurrence. Evidence to demonstrate effective implementation of corrective and preventive actions shall be submitted by the Contractor to the Engineer for review.

5.2.2. Notification of Nonconformities

If, prior to issue of the Taking – Over Certificate for the Contract Works or the relevant Section, the Contractor has used or proposes to use or repair any item of the Contract Works that does not conform to the requirements of the Contract, the Contractor shall immediately submit for review by the Engineer of such proposal and supplying full particulars of the non-conformity and, if appropriate, the proposed means of repair.

If the Engineer issues a non-conformity report or similar documents to notify the Contractor of any item of the Contract Works which does not conform to the requirements of the Contract, the Contractor shall promptly investigate the matter and, within 14 days of notification by the Engineer, submit to the Engineer for review the remedial measures and necessary actions to be taken to rectify the item and to prevent re-occurrence.

The Contractor shall maintain and update a Non-conformity Register to indicate the status of all non-conformities that are identified by the Engineer and/or the Contractor. The Contractor shall submit the register for review upon request by the Engineer.

5.4. Monthly Progress Report on Quality Management System

The Contractor shall continuously monitor the performance of the quality management system and shall include in each Monthly Progress Report:

- (1) The submission status and review the status of the quality system documents;
- (2) An up-to-date audit schedule and status;
- (3) An up-to-date non-conformity register providing the status of all non-conformity identified by the Engineer or the Contractor within the reporting period and those nonconformities not yet satisfactorily closed; and
- (4) A narrative appraisal of the performance of the quality management system, including any non-conformities, shortcomings, or problem areas identified and the corrective and preventative action taken or proposed.

The Contractor shall provide and maintain at all stages of the Contract Works, a quality control register, or registers to identify the status of inspections, sampling, and testing of the work, and all certificates. Such register shall be updated by the Contractor to show all activities in previous months and shall reach the Engineer’s office before the 7th day of each month.

Each register shall:

- (1) List the certificates received for each batch of goods and materials incorporated in the Contract Works and compare this against the certification required by the Contractor and the Contractor’s quality plans;
- (2) List the inspection and testing activities undertaken by the Contractor on each element of the Contract Works and compare these activities against the amount of inspection and testing required by the Contract and the Contractor’s quality plans;
- (3) Show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the pass/fail criteria; and
- (4) Summaries any actions proposed by the Contractor to overcome any nonconformity.

5.5. Quality Records

The Contractor shall ensure that all the quality records as objective evidence of the implementation of the quality management system are properly indexed, filed, maintained, updated, and stored in an acceptable software system. These records will be delivered to the Engineer in CD form upon completion of the Contract Works.

APPENDIX 6- ENGINEERING SAFETY MANAGEMENT PLAN

APPENDIX 7- OUTLINE INTERFACE MATRICES

ANNEX 1 – Civil Packages N-01 to N-05

ANNEX 2 – Civil Packages S-01 to S-07

ANNEX 3 – Civil Package CP05

ANNEX 4 – Civil Packages CP01 and CP02

ANNEX 1 – Civil Packages N-01 to N-05

A1. Substation System (SS-1 to SS-22) and Battery Post (BP-1 to BP-4)

A1.1. Substation & Battery Post (BP) Space and Building, Station, and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, 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 of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01's equipment	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04 05, and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM AFC, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
8	The foundation of CP NS-01 equipment's in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 05, and NS-01 Contractor shall coordinate and agree on the size and location.

A2. Power Distribution System

A2.1. Viaduct

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signalling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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 of the brackets.</p>
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CPNS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree and on the size and location.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall protect the water ingress.</p>

A2. Power Distribution System

A2.2. Station and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location CP NS-01. The contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, 04, and 05 Contractor on the location, size, and drilling method.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 equipment.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	The foundation of CP NS-01 equipment's in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size, weight, and location.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation/replacement	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
8	Oil fence around fuel tank, oil transformers, oil collecting pit, inspection cover, and associated drain pipe.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
9	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM AFC, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for and leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate for the design and agree on the space and access provision, and cavity walls.
10	Cable recess, trough, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
11	Cable recess, troughs, and pipes either across road or parallel to road, beneath road pavement concrete for all roadway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.

A3. Overhead Contact System

A3.1. Viaduct

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signalling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP NS-01 Contractor shall provide the draw wires.</p> <p>CP N-01, 02, 03, and 04 Contractors shall protect the water ingress.</p>

A3. Overhead Contact System

A.3.2 Station and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01, Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors in station structural frames	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, and 04 Contractors on the location, size, weight, and fixing method.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station and Depot (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 05, and NS-01 Contractor shall coordinate and agree on the size and location. CP-NS-01 Contractors shall supply the earthing devices for the station and depot.
5	Cable recess, trough, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
6	Cable recess, troughs, and pipes either across road or parallel to road, beneath road pavement concrete for all roadway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.

A.3.3 Underground Station and Tunnels

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	N-04	N-04 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Anchor Bolts	CP NS-01	CP NS-01	CP NS-01	CP-NS-01	CP NS-01 Contractor shall design, supply and install all fixings. The anchor bolts designs shall take into consideration the need to insulate the fixing and support from the concrete structure and re-bar. 100% of all drill fixed anchors shall be tested following installation.

A4. Signalling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location. Sockets that be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.
2	Supporting structures for power, communication, and signalling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.

3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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 bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.</p>
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall protect the water ingress.</p>

A4. Signalling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.2 Station and Depot

No.	Interface Item	Design Requirements	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Sockets that be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.
3	Supporting structures for power, communication, and signalling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, 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 of the brackets.

No.	Interface Item	Design Requirements	Design	Material Supply	Fix or Construction	Remarks
5	Cable recess, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
6	Leakage water protection from ceiling of SER, SUR, COM, AFC rooms, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for Leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	The foundation of CP NS-01 equipment's in SER, COM, AFC rooms.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location.

A5. Other Facilities in Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	CP N-05 and NS-01 Contractors shall coordinate and agree on the size and location.
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP N-05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
3	Supporting structures for power, communication, and signalling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 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 of the brackets.</p>
5	Opening for duct of equipment	CP NS-01	CP NS-01	CP N-05 and/or NS-01	CP N-05 and/or NS-01	CP N-05 Contractor shall coordinate to design the size of the opening based on equipment provided by CP NS-01 Contractor

A6. Automatic Fare Collection System

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04, and NS-01, Contractors shall coordinate and agree on the size and location.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	CP N-01, 02, 03, 04, and NS-01, Contractors shall coordinate and agree on the size and location.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall provide adequate thickness of screed or finishes.</p> <p>CP N-01, 02, 03 and 04 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
4	Cable pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road. Pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall ensure the cable pipes, ducts, etc. which are protected from ingress of water</p> <p>The pulling chambers shall be provided with drainage.</p>
5	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
6	Drilling for anchors	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, and 04 Contractors on the location, size, and drilling method.

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, 04, and 05 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 CP N-01, 02, 03, 04, and 05 Contractors under CP NS-01 Contractor’s supervision.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall implement jointly an inspection before casting.</p>

A.7 Platform Screen Doors

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall provide adequate thickness of screed or finishes.</p> <p>CP N-01, 02, 03 and 04 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, and 04 Contractors under CP NS-01 Contractor’s supervision.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall implement jointly an inspection before casting.</p>

ANNEX 2 – Civil Packages S-01 to S-07

A1 Substation System (S1, SS-1 to SS-18)

A1.1 Substation Space and Building, Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 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 bolt supplied matches the fixing provisions and that adequate construction tolerances are allowed between the fixing and mounting slots of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01’s equipment	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the location. Supporting fixtures for CP NS-01’s equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01’s equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and location.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
8	The foundations of CP NS-01 equipment in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and location

A2 Power Distribution System

A2.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
2	Supporting structures for power, telecom, and signaling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractor shall coordinate and agree adequate construction tolerances to be allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling method.</p> <p>CP NS-01 Contractor shall ensure that type of bolts supplied to match the fixing provisions and that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recesses and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 shall ensure that the structures containing electrical equipment are watertight and shall undertake tests to prove that as directed by the Engineer.</p>

A2.2 Station, Substations, and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Locations and sizes of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP NS-01 Contractor shall coordinate with CP S-01 to S-07 Contractors on the locations, sizes, and drilling methods.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 TO S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Foundation for CP NS-01's equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
8	Oil bunds around fuel tanks, oil transformers, oil collecting pit, inspection covers, and associated drain pipes.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
9	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
10	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.
11	Cable recesses, troughs and pipes either across road or parallel to road, beneath track road pavement concrete for all roadway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.
12	Earthing and grounding system	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. NS-01 Contractor shall supply the earthing devices for station & depot.

A3 Overhead Contact System

A3.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signaling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.</p>

A.3.2 Station, Substations and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors to station structural frames	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP NS-01 Contractor shall coordinate with CP S-01 to S-07 Contractor on the location, size, weight, and fixing method and supply brackets that fix to the existing station frames, i.e., no provision made within the station frames for bracket fixing.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station and Depot (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. The grounding provided by CP S-01 to S-07 will be via the reinforcement in the structure and piles, welded connections where required, and the provision of attachment points for the grounding system. The main room earth bars connected to the station earth will be provided and installed by S-01 to S-07 Contractors but checked by NS-01 Contractors. CP NS-01 Contractor shall supply the earthing devices for station and depot. NS-01 will provide surge arrestors and copper tapes etc. to connect to the earthing points provided by CP S-01 to S-07 Contractors.

A4 Signaling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct, U-shaped Ground Structures, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. Sockets shall be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
2	Supporting structures for power, communication, and signaling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.</p>

A.4.2 Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location Sockets that be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
3	Supporting structures for power, communication, and signaling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
5	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-06 and NS-01 Contractors shall protect against water ingress.
6	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP S-01 to S-06 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
7	Foundation for CP NS-01’s equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.

A5 Electrical and Mechanical Facilities in Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Openings for equipment ducts	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07	CP S-01 to S-07 Contractor shall coordinate to design the size of the openings based on equipment provided by CP NS-01 Contractor

A6 Automatic Fare Collection System

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 to S-06 and NS-01, Contractors shall coordinate and agree on the sizes and locations.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 TO S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP S-01 TO S-06 Contractor shall provide adequate thickness of screed or finishes. CP S-01 TO S-06 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.
4	Cable, pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road, pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 TO S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP S-01 TO S-06 Contractor shall ensure the cable, pipes, ducts, etc. are protected from ingress of water, and pulling chambers shall be provided with drainage and lockable covers.
5	Cast-in sockets including bolts, nuts, and washers, packing, and shims.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 shall supply all necessary materials and templates.
6	Drilling anchors for	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and/or NS-01	CP NS-01 Contractor shall coordinate with CP S-01 to S-06 Contractors on the locations, sizes, and drilling methods.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits (pull, junction and/or surface boxes, sheet metal trunking and ducting which are cast into concrete including provision of draw wires.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP S-01 to S-06 Contractors shall protect all ends and joints or conduits and boxes.</p> <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 CP S-01 to S-06 Contractors under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP S-01 to S-06 and NS-01 Contractors before casting and confirmed after casting.</p>

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	CP S-01 to S-06 and/or NS-01	<p>CP NS-01 Contractor shall coordinate with CP S-01 to S-06 Contractors 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	CP S-01 to S-06	CP S-01 to S-06	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall provide adequate thicknesses of screed and finishes.</p> <p>CP S-01 to S-06 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, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	<p>CP S-01 to S-06 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, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP S-01 to S-06 Contractors 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 CP S-01 to S-06 Contractors under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP S-01 to S-06 and NS-01 Contractors before casting and confirmed after casting.</p>

ANNEX 3 – Civil Package CP05

A1 Substation System (TSS1)

A1.1 Substation Space and Building, Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 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 bolt supplied matches the fixing provisions and that adequate construction tolerances are allowed between the fixing and mounting slots of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01’s equipment	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the location. Supporting fixtures for CP NS-01’s equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP05 & NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01’s	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and location.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	equipment installation / replacement					
8	The foundations of CP NS-01 equipment in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and location

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

A2 Power Distribution System

A2.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
2	Supporting structures for power, telecom, and signaling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractor shall coordinate and agree adequate construction tolerances to be allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling method.</p> <p>CP05 and CP NS-01 Contractor shall ensure that type of bolts supplied to match the fixing provisions and that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
4	Cable recesses and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 and CP NS-01 Contractor shall provide draw wires.</p> <p>CP05 shall ensure that the structures containing electrical equipment are watertight and shall undertake tests to prove that as directed by the Engineer.</p>

A2.2 Station, Substations,

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Locations and sizes of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP05	CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, sizes, and drilling methods.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Foundation for CP NS-01's equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Oil bunds around fuel tanks, oil transformers, oil collecting pit, inspection covers, and associated drain pipes.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
9	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP05	CP05	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
10	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.
11	Cable recesses, troughs and pipes either across road or parallel to road, beneath track road pavement concrete for all roadway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.
12	Earthing and grounding system	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. NS-01 Contractor shall supply the earthing devices for station & depot.

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

A3 Overhead Contact System

A3.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signaling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP05 and NS-01 Contractors shall protect against water ingress.</p>

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

A.3.2 Station, Substations

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors to station structural frames	CP NS-01	CP NS-01	CP NS-01	CP05	CP NS-01 Contractor shall coordinate with CP05 Contractor on the location, size, weight, and fixing method and supply brackets that fix to the existing station frames, i.e. no provision made within the station frames for bracket fixing.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The grounding provided by CP05 will be via the reinforcement in the structure and piles, welded connections where required, and the provision of attachment points for the grounding system. The main room earth bars connected to the station earth will be provided and installed by CP05 Contractor but checked by NS-01 Contractor. CP NS-01 Contractor shall supply the earthing devices for station and depot. NS-01 will provide surge arrestors and copper tapes etc. to connect to the earthing points provided by CP05 Contractor.

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

A4 Signaling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct, U-shaped Ground Structures, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. Sockets shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
2	Supporting structures for power, communication, and signaling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP05 Or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP05 or CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.

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

A.4.2 Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location Sockets that be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
3	Supporting structures for power, communication, and signaling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.
5	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all	CP NS-01	CP NS-01	CP05 or NS-01*	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items					CP05 and NS-01 Contractors shall protect against water ingress.
6	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP05	CP05	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
7	Foundation for CP NS-01’s equipment in SER, SUR, COM, AFC and like	CP NS-01	CP NS-01	CP05 or NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.

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

A5 Electrical and Mechanical Facilities in Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Openings for equipment ducts	CP NS-01	CP NS-01	CP05 or NS-01*	CP05	CP05 Contractor shall coordinate to design the size of the openings based on equipment provided by CP NS-01 Contractor

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

A6 Automatic Fare Collection System

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01, Contractors shall coordinate and agree on the sizes and locations.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP05 Contractor shall provide adequate thickness of screed or finishes. CP05 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.
4	Cable, pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road, pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP05 Contractor shall ensure the cable, pipes, ducts, etc. are protected from ingress of water, and pulling chambers shall be provided with drainage and lockable covers.
5	Cast-in sockets including bolts, nuts, and washers, packing, and shims.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 shall supply all necessary materials and templates.
6	Drilling for anchors	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, sizes, and drilling methods.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits (pull, junction and/or surface boxes, sheet metal trunking and ducting which are cast into concrete including provision of draw wires.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	<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> <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 NS-01 Contractors before casting and confirmed after casting.</p>

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

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	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Insulation Membrane	CP NS-01	CP05	CP05	CP05	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

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 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

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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</p> <p>There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability.</p> <p>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</p> <p>There shall be interface for Integrated OCC (IOCC) for overall control from Mabalacat OCC.</p>	<p>works</p> <p>CP04 shall connect their equipment to cable terminations done by NS-01</p> <p>CP04 shall interface for CBI, ETCS and ATS level.</p> <p>CP04 shall interface for common parameters of ETCS including RBC demarcation handover.</p> <p>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</p> <p>There shall be interface at CBI level, ETCS level and ATS level for smooth interoperability.</p> <p>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.</p> <p>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</p> <p>CP04 shall interface for CBI, ETCS and ATS level.</p> <p>CP04 shall interface for common parameters of ETCS.</p> <p>CP04 shall interface for transfer of control to IOCC.</p> <p>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>

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>	Rail-wheel interface study	Provision of wheel interface information to be used in rail-wheel interface study
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>	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	CP107 shall interface for development of interface matrix and interface at all stages of the project with NS-01.

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>	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	CP107 shall interface for the development of an interface matrix and interface at all stages of the project with NS-01.

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>		

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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.		

The Malolos – Clark Railway Project and the North
 South Railway Project-South Line (Commuter)
 CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
 Section V1. Employer's Requirements
 General Requirements

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

BIDDING DOCUMENTS

FOR

PROCUREMENT OF

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

WORKS

Volume II of IV

PART 2 Employer's Requirements

March 2021

Employer:	Department of Transportation
Procuring Agent:	Procurement Service
Country:	Republic of the Philippines
Project:	The Malolos–Clark Railway Project and the North South Railway Project-South Line (Commuter)
JICA Loan No.:	PH-P270

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BIDDING DOCUMENTS

FOR

PROCUREMENT OF

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

Volume II of IV

PART 2 Employer's Requirements

March 2021

Employer:	Department of Transportation
Procuring Agent:	Procurement Service
Country:	Republic of the Philippines
Project:	The Malolos–Clark Railway Project and the North South Railway Project-South Line (Commuter)
JICA Loan No.:	PH-P270

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BIDDING DOCUMENTS

SUMMARY OF DOCUMENTS

Invitation for Bids

Volume I. Part 1 - Bidding Procedures

- Section I. Instructions to Bidders (ITB)
- Section II. Bid Data Sheet (BDS)
- Section III. Evaluation and Qualification Criteria (EQC)
- Section IV. Bidding Forms (BF)
- Section V. Eligible Source Countries of Japanese ODA Loan (ESC)

Volume II. Part 2 – Employer's Requirements

Section VI. Employer's Requirements (ER)

- a) Scope of Works (SOW)**
- b) General Requirements (ERG)**
- c) Technical Requirements (ERT)**

Volume III. Part 2 – Employer's Requirements

- Section VI. Employer's Requirements (ER)
- d) Employer's Drawings (ERD)

Volume IV. Part 3 - Conditions of Contract and Contract Forms

- Section VII. General Conditions (GC)
- Section VIII. Particular Conditions (PC)
- Section IX. Annexes to Particular Conditions-Contract Forms (CF)

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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

3.10	Additional Land for Construction Purposes, Detours, Plant and Other Uses	ERG-9
4.	Project Management by the Contractor	ERG-10
4.1	Contractor's Management Plans	ERG-10
4.2	Project Management Plan	ERG-10
4.3	Interface Management Plan	ERG-11
4.4	Works Program	ERG-13
4.5	Quality Assurance Management Plan	ERG-16
4.6	System Assurance Management Plan	ERG-18
4.7	Site Safety Management Plan	ERG-19
4.8	Software Quality Assurance Management Plan	ERG-24
4.9	Risk Management Plan	ERG-24
4.10	COVID-19 Risk Management Plan	ERG-27
4.11	Environmental Management Plan	ERG-27
4.12	Inspection, Testing and Commissioning Management Plan	ERG-34
4.13	Earthing and Bonding Strategy Plan	ERG-34
4.14	Review Periods for Contractor's Submissions	ERG-34
4.15	Failure to Make Submission	ERG-35
4.16	Plans and Program Revision	ERG-35
4.17	Planning and Programming Staff	ERG-35
4.18	Project Calendar	ERG-35
4.19	Progress Reporting	ERG-35
4.20	Co-ordination and Interface with Interface Contractors and Others	ERG-35
4.21	Spare Parts Management Plan	ERG-37
5.	Works Train Operations	ERG-38
5.1	Requirements during the Construction	ERG-38
6.	Design Submission Requirements	ERG-39
6.1	General	ERG-39
6.2	Review of Data	ERG-39
6.3	Format of Deliverables	ERG-40
6.4	Number of Copies	ERG-41
6.5	Design Submission Program	ERG-41
6.6	Design Process	ERG-41
6.7	Preliminary Design	ERG-42
6.8	Pre-Final Design	ERG-42
6.9	Final Design	ERG-42
6.10	Design Submission and Review Procedure	ERG-42
6.11	Engineer's Review	ERG-43
6.12	Final Design Document Delivery	ERG-44
6.13	As-Built Drawings and Records	ERG-44
6.14	Post Acceptance Changes	ERG-45
6.15	Approval of Manufacturers and Suppliers	ERG-45

6.16	Material Control Schedule	ERG-45
6.17	Method Statements	ERG-46
7.	Document and Drawing Submittals and Review	ERG-46
7.1	General	ERG-46
7.2	Project Document Control Procedure	ERG-47
7.3	Document Submissions	ERG-47
7.4	Submission and Response Procedure	ERG-47
7.4.1	General	ERG-47
7.4.2	Proposal	ERG-47
7.4.3	Submission Response Request	ERG-47
7.4.4	Reports and Records	ERG-48
8.	Manuals and Documents	ERG-48
8.1	Manuals and Documents for Equipment and Systems	ERG-48
8.2	Operation Manuals	ERG-49
8.3	Maintenance Manuals	ERG-49
8.4	Electronic Manuals	ERG-50
8.5	Operating/User Manuals and Maintenance and Servicing Manuals	ERG-50
8.6	Submission of Manuals and Documents	ERG-51
8.7	Number of Submission Copies	ERG-51
9.	Manpower and Workforce	ERG-51
9.1	Local and Overseas Filipino Worker (OFW)	ERG-51
9.2	Engagement of Staff and Labor	ERG-51
10.	Inspection, Testing, and Commissioning	ERG-51
10.1	General	ERG-51
10.2	Non-Conformity and Deviation Disposition	ERG-54
10.3	Engineer's Stop Work Order (SWO)	ERG-55
10.4	Engineer's Corrective Action Request (CAR)	ERG-55
10.5	Test Groups	ERG-55
11.	Defects Liability	ERG-56
11.1	Remedying Defects	ERG-56
11.2	Defects Notification Period	ERG-57
12.	Software Management and Control	ERG-58
12.1	Prescriptive Framework	ERG-58
12.2	Software Framework	ERG-59
12.3	Software Management Control	ERG-59
12.4	Auditing	ERG-59
12.5	Software Acceptance	ERG-59
12.6	Availability of Source Code and Development Tools	ERG-60
12.7	Re-Use of Existing Software	ERG-60
12.8	Test Software	ERG-60
12.9	Software Rights	ERG-61
13.	Supply of Spare Parts, Special Tools, and Test Equipment	ERG-61
13.1	Details of supply	ERG-61

	13.2	Manufacture and delivery of Spare Parts	ERG-62
	13.3	Testing and Commissioning Spares	ERG-63
	13.4	O&M Spares	ERG-63
	13.5	Special Tools and Test Equipment	ERG-64
	13.6	Coding and Tagging of all Equipment, Spare Parts and Special Tools and Test Equipment	ERG-65
14.		Packaging, Shipping, and Delivery	ERG-65
	14.1	General	ERG-65
	14.2	Crating	ERG-66
	14.3	General Precautions	ERG-66
	14.4	Packing Procedures	ERG-67
	14.5	Shipping	ERG-67
	14.6	Delivery	ERG-68
15.		Training	ERG-68
	15.1	General	ERG-68
	15.2	Training Requirements	ERG-68
	15.3	Training Periods	ERG-69
	15.4	Language of Training Courses	ERG-69
	15.5	Training Instructors	ERG-69
	15.6	Contractor’s obligation to obtain Approval of Instructors	ERG-69
	15.7	Employer’s Railway Operations Staff	ERG-69
	15.8	Training Program	ERG-69
	15.9	Training Courses	ERG-70
	15.10	All Necessary Railway Operational Instruction Aids and Materials	ERG-70
	15.11	Plant and materials set aside for Training Purposes	ERG-70
	15.12	Protective Clothing-Training	ERG-70
	15.13	Monitoring	ERG-70
	15.14	Training Practical Tests and Aptitude Reports	ERG-70
	15.15	Monitoring of Training Progress	ERG-70
	15.16	Records of Training Progress to be Maintained	ERG-71
	15.17	Issue Test Results and progress to the Engineer	ERG-71
	15.18	Training Location and Facilities	ERG-71
	15.19	Occupational Health and Safety of Trainees	ERG-71
	15.20	Administration	ERG-71
16.		Site Office and Site Office Management	ERG-72
	16.1	Site Restrictions	ERG-72
	16.2	Site Office Facilities	ERG-72
	16.3	Site Management	ERG-73
	16.4	Services	ERG-74
	16.5	Accommodation	ERG-74
17.		Road Traffic and Transportation	ERG-75
	17.1	General	ERG-75
	17.2	Transportation to Site	ERG-75
18.		Meeting Requirements	ERG-76

18.1	General	ERG-76
18.2	Monthly Progress Meetings	ERG-77
18.3	Programme Analysis Report	ERG-78
19.	Liaison with Others	ERG-79
19.1	Approvals from Government Authorities and Agencies	ERG-79
19.2	Meetings with the Engineer	ERG-79
19.3	Meetings with the O&M Concessionaire	ERG-79
19.4	Meetings with Government Departments and Agencies	ERG-79
19.5	Correspondence with Government Departments and Agencies	ERG-79
20.	Interface Management	ERG-79
20.1	General	ERG-79
20.2	Exchange of Information with Interfacing Contractors	ERG-80
20.3	Request for Information	ERG-81
20.4	Interface and Co-ordination with Interfacing Contractors	ERG-81
20.5	Meetings with Interfacing Contractors	ERG-82
20.6	Issuance of Information Related to Interfaces and Coordination	ERG-82
20.7	Liability for Failed Interfaces	ERG-82
20.8	Design Co-ordination with Interface Contractors	ERG-82
20.9	Construction Interfaces and Co-ordination	ERG-83
20.10	Interface Management Plan	ERG-83
21.	System Assurance	ERG-85
21.1	General	ERG-85
21.2	System Safety Assurance Management	ERG-87
21.3	Reliability, Availability, and Maintainability Management	ERG-89
21.4	Electromagnetic Compatibility (EMC) Management	ERG-94
21.5	Engineering Change Management	ERG-95
22.	Requirements Management	ERG-96
23.	Asset Management	ERG-97
24.	Demobilization and Closing Works	ERG-98
24.1	Demobilization	ERG-98
24.2	Closing Works	ERG-99
24.3	Training Completion	ERG-100
25.	Security and Insurance	ERG-100
25.1	Security	ERG-100
25.2	Insurance	ERG-100
<u>26</u>	<u>Publicity and Public Relations</u>	<u>ERG-100</u>
<u>26.1</u>	<u>General</u>	<u>ERG-100</u>
26.2	Public Relations Plan	<u>ERG-101</u>
26.3	Public Consultation	<u>ERG-102</u>
26.4	Public Relations Tools	<u>ERG-102</u>
26.5	Co-ordination with Other Contractors	<u>ERG-103</u>
Appendix 1: General Abbreviations		<u>ERG-105</u>
Appendix 2: Program		<u>ERG-108</u>
Appendix 3: Monthly Progress Report		<u>ERG-123</u>

Appendix 4: Submittals Required	ERG-1252
Appendix 5: Quality Assurance Requirements	ERG-1274
Appendix 6: Engineering Safety Management Plan	ERG-13229
Appendix 7: Outline Interface Matrices	ERG-1330
Appendix 8: Outline Interface Demarcation with MMSP and NSCR	ERG-18077

c) Technical Requirements (ERT)

1. Track Works

1.1	Scope of Works	ERT-1
1.2	Definitions and Abbreviations	ERT-2
1.3	List of Acronyms and Abbreviations	ERT-3
1.4	Design Requirements	ERT-5
1.5	Particular Track Specifications	ERT-9
1.6	Operational Criteria	ERT-13
1.7	Component Design List	ERT-14
1.8	Track Work Construction	ERT-15
1.9	Procedures	ERT-16
1.10	Installation	ERT-18
1.11	Construction Tolerances	ERT-20
1.12	Rail	ERT-22
1.13	Rail Fastening System	ERT-26
1.14	Prestressed Concrete Sleepers	ERT-32
1.15	Track Ballast	ERT-33
1.16	Rail Expansion Joints	ERT-34
1.17	Turnout	ERT-35
1.18	Rail Welding	ERT-40
1.19	Buffer Stops	ERT-45
1.20	Insulated Rail Joint Glued Type	ERT-46
1.21	Staff Walkway in Depot	ERT-47
1.22	Stray Current Corrosion Control	ERT-47
1.23	Walkway	ERT-47
1.24	Access Platform and Stairs	ERT-50
1.25	Depot Line and Load Gauge	ERT-50
1.26	Miscellaneous Track Work Items	ERT-51
1.27	Track Maintenance Vehicles and Equipment	ERT-51
1.28	Interfacing Requirements	ERT-63
1.29	Maintenance, Manual and Knowledge Transfer	ERT-64
1.30	Testing, Commissioning and Verification	ERT-66
1.31	Packing, Shipping, Storage and Delivery	ERT-70

2. Signaling System

2.1	Introduction	ERT-72
2.2	Definitions and Abbreviations	ERT-72
2.3	List of Standards	ERT-80
2.4	Scope of Work	ERT-83

2.5	General Requirements	ERT-85
2.6	Scope of Supply	ERT-85
2.7	Services	ERT-88
2.8	Performance Requirements	ERT-89
2.9	Electromagnetic Compatibility	ERT-95
2.10	Functional Requirements	ERT-100
2.11	Operating Criteria	ERT-102
2.12	System Architecture	ERT-106
2.13	Emergency Stop Switches	ERT-114
2.14	ATP Functional Requirements	ERT-115
2.15	ATP On-board equipment	ERT-116
2.16	Computer Based Interlocking	ERT-118
2.17	Automatic Train Supervision (ATS)	ERT-124
2.18	Operations Control Center (OCC)	ERT-145
2.19	Depot	ERT-149
2.20	Wayside Equipment	ERT-151
2.21	Environmental	ERT-154
2.22	Power Supply Requirements	ERT-155
2.23	Design Requirements	ERT-157
2.24	System Safety Design Requirements	ERT-159
2.25	Quality Assurance	ERT-161
2.26	Interfaces	ERT-161
2.27	Installation	ERT-166
2.28	Cables	ERT-168
2.29	Identification	ERT-171
2.30	Drawings and Records	ERT-172
2.31	Earthing and Transient Protection	ERT-172
2.32	Transient and Lightning Protection	ERT-173
2.33	Verification, Testing and Commissioning	ERT-174
2.34	Reporting	ERT-184
2.35	Operation and Maintenance Support	ERT-185
2.36	Spare Parts, Special Tools and Test Equipment	ERT-186
2.37	Training	ERT-186
2.38	Appendix A1: Signaling/Rolling Stock Interfaces	ERT-187
2.39	Appendix A2 –Station and Depot Civil and E&M, Contractors Interfaces	ERT-199
2.40	Appendix A3 – Train Control/Communication Contractors Interfaces	ERT-199
2.41	Appendix A4 – Train Control/Track Contractor Interfaces	ERT-202
2.42	Appendix A5 – Train Control/Power Supply (including Traction, Substation, Power Distribution & OCS) Interfaces	ERT-206
2.43	EMC Management Plan	ERT-207
3.	Telecommunications	
3.1	Introduction	ERT-208

3.2	Scope of Work	ERT-208
3.3	Definitions and Abbreviations	ERT-211
3.4	Design Standards	ERT-222
3.5	General Design Requirements	ERT-226
3.6	System Requirements	ERT-228
3.7	Performance Requirements (General)	ERT 233
3.8	Packing, Shipping and Delivery	ERT-234
3.9	Testing, Commissioning & Verification	ERT-234
3.10	Consumable and Spare Parts	ERT-240
3.11	Interface Requirements	ERT-241
	Appendix 1: Backbone Transmission System (BTS)	ERT-251
	Appendix 2: Radio System	ERT-261
	Appendix 3: Voice and Data Systems	ERT-312
	Appendix 4: Closed Circuit Television (CCTV) System	ERT-318
	Appendix 5: Passenger Information Display System (PIDS)	ERT-331
	Appendix 6: Public Address (PA) System	ERT-335
	Appendix 7: Time Server and Master Clock System	ERT-343
	Appendix 8: Meteorological and Seismic Monitoring System	ERT-348
	Appendix 9: Power Supply for Telecommunication System (UPS)	ERT-351
	Appendix 10: Flight Information Display System (FIDS)	ERT-357
4.	Power Supply System	
I.	The Malolos-Clark Railway Project (MCRP)	
4.1	Scope of Work	ERT-360
4.2	Definitions and Abbreviations	ERT-369
4.3	Design Criteria and Standards	ERT-372
4.4	Technical Requirements	ERT-375
4.5	Installation requirement	ERT-396
4.6	Interfacing Requirements	ERT-399
4.7	Testing, Commissioning and Verification	ERT-401
4.8	Measuring and Special Tools	ERT-406
4.9	Training Requirements	ERT-406
4.10	Maintenance Requirements	ERT-408
II.	The North South Railway Project-South line (Commuter) (NSRP-South)	ERT-410
4.1	Scope of Work	ERT-410
4.2	Definitions and Abbreviations	ERT-418
4.3	Design Criteria and Standards	ERT-421
4.4	Technical Requirements	ERT-424
4.5	Installation requirement	ERT-446
4.6	Interfacing Requirements	ERT-448
4.7	Testing, Commissioning and Verification	ERT-450
4.8	Measuring and Special Tools	ERT-455
4.9	Training Requirements	ERT-455
4.10	Maintenance Requirements	ERT-458

5.	Power Distribution System	
	I. The Malolos-Clark Railway Project (MCRP)	ERT-459
5.1	Scope of Works	ERT-459
5.2	Definitions and Abbreviations	ERT-468
5.3	Design Criteria, Applicable Standards and Codes	ERT-470
5.4	Performance Requirements	ERT-471
5.5	Operational Requirements	ERT-472
5.6	Functional Requirements	ERT-472
5.7	Installation Requirements	ERT-484
5.8	Interfacing Requirements	ERT-486
5.9	Testing, Commissioning and Verification	ERT-486
5.10	Measuring and Special Tools	ERT-491
5.11	Training Requirements	ERT-492
5.12	Maintenance Requirements	ERT-494
	II. The North South Railway Project-South line (Commuter) (NSRP-South)	ERT-497
5.1	Scope of Works	ERT-497
5.2	Definitions and Abbreviations	ERT-508
5.3	Design Criteria, Applicable Standards and Codes	ERT-510
5.4	Performance Requirements	ERT-511
5.5	Operational Requirements	ERT-512
5.6	Functional Requirements	ERT-512
5.7	Installation Requirements	ERT-524
5.8	Interfacing Requirements	ERT-526
5.9	Testing, Commissioning and Verification	ERT-526
5.10	Measuring and Special Tools	ERT-531
5.11	Training Requirements	ERT-532
5.12	Maintenance Requirements	ERT-534
6.	Overhead Contact Line System	
6.1	Scope of Works	ERT-537
6.2	Fundamental Design Data	ERT-559
6.3	System Requirements	ERT-565
6.4	Standard Equipment Requirements	ERT-576
6.5	Testing, Inspection and Commissioning	ERT-611
6.6	Documentation	ERT-612
6.7	Quality Assurance and Control	ERT-613
6.8	Overhead Line Inspection Vehicle	ERT-613
6.9	Special Tools	ERT-616
6.10	Training Program	ERT-617
7.	Automatic Fare Collection (AFC)	
7.1	Scope of Works	ERT-619
7.2	Limited Express Ticket System	ERT-619
7.3	Definitions and Abbreviations	ERT-620
7.4	Scope of Equipment Supply	ERT-623

7.5	Equipment Environmental Conditions	ERT-625
7.6	Documentation	ERT-626
7.7	System Operational Requirements	ERT-627
7.8	System Requirements	ERT-641
7.9	Equipment, Design and Material Requirements	ERT-648
7.10	Interfaces	ERT-665
7.11	Packing, Shipping, Storage and Delivery	ERT-667
7.12	Testing, Commissioning and Verification	ERT-668
7.13	Installation	ERT-670
7.14	Training	ERT-673
7.15	Maintenance	ERT-674
7.16	Measuring and Special Tools	ERT-675
8.	Depot Facilities	
8.1	Scope of Works	ERT-676
8.2	Definitions and Abbreviations	ERT-682
8.3	Design Criteria, Applicable Standards and Codes	ERT-683
8.4	Engineering Conditions	ERT-685
8.5	Design Parameters	ERT-686
8.6	Performance and Technical Requirements	ERT-686
8.7	Maintenance Management	ERT-688
8.8	Depot/Workshop Capacity	ERT-689
8.9	Depot/Workshop Maintenance Facilities	ERT-701
8.10	Depot/Workshop Layout	ERT-713
8.11	Interface Coordination	ERT-718
8.12	Testing, Commissioning and Verification	ERT-719
8.13	Training	ERT-719
8.14	Drawings	ERT-720
	Appendix 8-1	ERT-721
Part A	North Depot	ERT-721
	N01 Light Repair Shop	ERT-722
	N01.01 Cleaning Set	ERT-722
	N01.02 Air Blow Booth with Dust Collector	ERT-723
	N01.03 Insulation Resistance Tester	ERT-724
	N01.04 Battery Charger	ERT-725
	N01.05 Filter Washing Machine	ERT-726
	N01.06 Double Head Grinder	ERT-727
	N01.07 Upright Drilling Machine	ERT-728
	N01.08 Disc Cutter	ERT-729
	N01.09 Welding Machine	ERT-730
	N01.10 Oxygen Acetylene Gas Welder	ERT-731
	N01.11 Air Compressor (Include Air tank)	ERT-732
	N01.12 Forklift Truck 2t	ERT-733
	N01.13 Worktable	ERT-734
	N01.14 Tool Cabinet	ERT-736

N01.15 Rack System	ERT-736
N01.16 High-Pressure Water Cleaner	ERT-737
N01.17 Sewage Discharge Pipe	ERT-738
N01.18 Front Car Maintenance Platform	ERT-739
N02 UN-Scheduled Repair Shop	ERT-740
N02.01 10/3t Overhead Travelling Crane	ERT-740
N02.02 Bogie Replacing Equipment	ERT-741
N02.03 Underfloor Equipment Exchange Device 2t	ERT-743
N02.04 Movable Lifting Platform	ERT-744
N02.05 Boarding Step	ERT-745
N02.06 Welding Machine	ERT-746
N02.07 Oxygen Acetylene Gas Welder	ERT-747
N02.08 Work Table	ERT-748
N02.09 Tool Cabinet	ERT-749
N02.10 Front Car Working Deck	ERT-740
N03 Under Floor Wheel Re-Profiling Lathe	ERT-751
N03.01 Under Floor Wheel Re-Profiling Lathe	ERT-751
N03.02 Jib Crane 1t	ERT-754
N03.03 Worktable	ERT-755
N03.04 Tool Cabinet	ERT-756
N03.05 Baby Compressor	ERT-757
N04 Carbody Washer	ERT-758
N04.01 Automatic Car Body Washer	ERT-758
N11 Underfloor Cleaning Shop	ERT-761
N11.01 Underfloor Air Blow Machine with Dust Collector	ERT-761
N12 Bogie Removal / Installation Shop	ERT-762
N12.01 10/3 t Overhead Traveling Crane	ERT-762
N12.02 Car Body Lifting Jack	ERT-763
N12.03 Not Used	ERT-765
N12.04 Temporary Bogie	ERT-766
N12.05 Welding Machine	ERT-767
N12.06 Oxygen Acetylene Gas Welder	ERT-768
N12.07 Work Table	ERT-769
N12.08 Tool Cabinet	ERT-770
N12.09 Bogie Transport Equipment	ERT-771
N13 Carbody Shop	ERT-772
N13.01 3t Overhead Traveling Crane	ERT-772
N13.02 Not Used	ERT-773
N13.03 Underfloor Equipment Lifter 2t	ERT-774
N13.04 Movable Lifting Platform	ERT-775
N13.05 Boarding Step	ERT-776
N13.06 Tight lock Coupler Carrier	ERT-777
N13.07 Double Head Grinder	ERT-779

N13.08 Upright Drilling Machine	ERT-780
N13.09 Disc Cutter	ERT-781
N13.10 Welding Machine	ERT-782
N13.11 Oxygen Acetylene Gas Welder	ERT-783
N13.12 Work Table	ERT-784
N13.13 Tool Cabinet	ERT-785
N14 Sewage Tank Shop	ERT-786
N14.01 3t Overhead Traveling Crane	ERT-786
N14.02 High-Pressure Water Cleaner	ERT-787
N14.03 Work Table	ERT-788
N14.04 Tool Cabinet	ERT-789
N15 Paint Shop	ERT-790
N15.01 Work Lift Platform	ERT-791
N15.02 Car Body Washing Booth	ERT-791
N15.03 Car Body Painting Booth	ERT-792
N15.04 Car Body Drying Booth	ERT-793
N15.05 Airless Spray-painting Machine	ERT-795
N15.06 Parts Painting Booth	ERT-796
N15.07 Traverser	ERT-797
N16 Traction Motor Shop	ERT-799
N16.01 3t Overhead Traveling Crane	ERT-799
N16.02 Air Blow Booth with Dust Collector	ERT-800
N16.03 Insulation Resistance Tester	ERT-801
N16.04 Grease Supply Equipment	ERT-802
N16.05 Induction Heater for flexible coupling	ERT-803
N16.06 Motor No-load Test Equipment	ERT-804
N16.07 Rack System	ERT-805
N16.08 Work Table	ERT-806
N16.09 Tool Cabinet	ERT-807
N17 Bogie Shop	ERT-808
N17.01 10 /3t Overhead Traveling Crane	ERT-808
N17.02 5t Overhead Traveling Crane	ERT-809
N17.03 Bogie Turntable	ERT-810
N17.04 Wheelset Turntable	ERT-811
N17.05 Bogie Disassembling/Assembling	ERT-812
N17.06 Bogie Washing Machine	ERT-813
N17.07 Bogie Frame Stand Set	ERT-815
N17.08 Magnetic Flaw Detector (Movable)	ERT-816
N17.09 Bogie Painting/Drying Booth,	ERT-818
N17.10 Double Head Grinder	ERT-820
N17.11 Upright Drilling Machine	ERT-821
N17.12 Welding Machine	ERT-822
N17.13 Oxygen Acetylene Gas Welder	ERT-823
N17.14 Work Table	ERT-824

N17.15 Tool Cabinet	ERT-825
N17.16 3t Overhead Traveling Crane	ERT-826
N17.17 Bogie Test Stand	ERT-827
N18 Air Conditioner Shop	ERT-828
N18.01 3t Overhead Traveling Crane	ERT-828
N18.02 High-Pressure Water Cleaner	ERT-829
N18.03 Air Conditioner Parts Washing Bath	ERT-830
N18.04 Air Conditioner Testing System	ERT-831
N18.05 Copper Pipe Cutting Welding Equipment	ERT-832
N18.06 Cooler Carrier	ERT-833
N18.07 Work Table	ERT-834
N18.08 Tool Cabinet	ERT-835
N18.09 Pump Down Equipment w/ Recovery Tank	ERT-836
N18.10 Refrigerant Charging Equipment	ERT-837
N18.11 Gas Leak Detector	ERT-838
N19 Electric Parts Shop	ERT-839
N19.01 Air Blow Booth with Dust Collector	ERT-839
N19.02 Parts Washer	ERT-840
N19.03 Insulation Resistance Tester	ERT-841
N19.04 Test electric Power Supply	ERT-842
N19.05 Induction Heater	ERT-843
N19.06 Air Compressor Testing Equipment	ERT-844
N19.07 Pantograph Testing Equipment	ERT-845
N19.08 Battery Charger	ERT-846
N19.09 Soft Blast Equipment	ERT-847
N19.10 Double Head Grinder	ERT-848
N19.11 Upright Drilling Machine	ERT-849
N19.12 Work Table	ERT-850
N19.13 Tool Cabinet	ERT-851
N19.14 3t Overhead Traveling Crane	ERT-852
N20 Wheelset Shop	ERT-853
N20.01 3t Overhead Traveling Crane	ERT-853
N20.02 Wheelset Turntable	ERT-854
N20.03 Axle Bearing Pulling/Fitting Press	ERT-855
N20.04 Wheelset Washing Machine	ERT-856
N20.05 Axle Grinding Machine	ERT-858
N20.06 Axle Magnetic Flaw Detector	ERT-860
N20.07 Axle Ultrasonic Flaw Detector	ERT-862
N20.08 Surface Wheel Lathe	ERT-864
N20.09 Oil Flushing Equipment	ERT-866
N20.10 Axle Lathe	ERT-868
N20.11 Wheel Boring Machine	ERT-869
N20.12 Wheel Fitting Press	ERT-871
N20.13 Work Table	ERT-873

N20.14 Tool Cabinet	ERT-869
N21 Bearing Shop	ERT-875
N21.01 Bearing Washer	ERT-875
N21.02 Oil seal draw-out equipment	ERT-876
N21.03 Oil seal fit & grease supply equipment	ERT-877
N21.04 Work Table	ERT-879
N21.05 Tool Cabinet	ERT-880
N22 Spring, Air Spring, Brake Parts & Iron Workshop	ERT-881
N22.01 3t Overhead Traveling Crane	ERT-881
N22.02 Shot Blast Machine	ERT-882
N22.03 Magnetic Flaw Detector	ERT-883
N22.04 Coil Spring Tester	ERT-885
N22.05 Hydraulic Press 30t	ERT-886
N22.06 Air Spring Leakage Tester	ERT-887
N22.07 Oil Damper Tester	ERT-888
N22.08 Double Head Grinder	ERT-890
N22.09 Upright Drilling Machine	ERT-891
N22.10 Welding Machine	ERT-892
N22.11 Oxygen Acetylene Gas Welder	ERT-893
N22.12 Work Table	ERT-894
N22.13 Tool Cabinet	ERT-895
N23 Tight Lock Coupler and Draft Gear Shop	ERT-896
N23.01 3t Overhead Traveling Crane	ERT-896
N23.02 Parts Washer	ERT-897
N23.03 Magnetic Flaw Detector	ERT-899
N23.04 Hydraulic Press 50t	ERT-900
N23.05 Draft Gear Setter	ERT-901
N23.06 Double Head Grinder	ERT-902
N23.07 Upright Drilling Machine	ERT-903
N23.08 Welding Machine	ERT-904
N23.09 Oxygen Acetylene Gas Welder	ERT-905
N23.10 Work Table	ERT-906
N23.11 Tool Cabinet	ERT-907
N24 Seat Shop	ERT-908
N24.01 3t Overhead Traveling Crane	ERT-908
N24.02 Seat Cleaning Machine	ERT-909
N24.03 Vacuum Cleaner	ERT-910
N24.04 Work Table	ERT-911
N24.05 Tool Cabinet	ERT-912
N25 Air Brake Valve Shop	ERT-913
N25.01 Parts Washer	ERT-913
N25.02 Ultrasonic Parts Cleaner	ERT-914
N25.03 Air Blow Booth with Dust Collector	ERT-915
N25.04 Pressure Gauge Tester	ERT-916

N25.05 Hydraulic Press 30t	ERT-917
N25.06 Work Table	ERT-918
N25.07 Tool Cabinet	ERT-919
N26 Mechanical Shop	ERT-920
N26.01 3t Overhead Traveling Crane	ERT-920
N26.02 Lathe	ERT-921
N26.03 Pipe Threading Machine	ERT-922
N26.04 Universal Milling Machine	ERT-923
N26.05 Double Head Grinder	ERT-924
N26.06 Upright Drilling Machine	ERT-925
N26.07 Radial Drilling Machine	ERT-926
N26.08 Metal Cutting Machine	ERT-927
N26.09 Work Table	ERT-928
N26.10 Tool Cabinet	ERT-929
N27 Warehouse	ERT-930
N27.01 Rack System	ERT-930
N27.02 Wheelset Storage System	ERT-931
N27.03 Traction Motor storage System	ERT-932
N28 Compressor Room	ERT-933
N28.01 Air Compressor (Include Air Tank)	ERT-933
N29 Not Used	ERT-934
N30 Weatherproof Test Shop	ERT-935
N30.01 Weatherproof Testing Equipment	ERT-935
N31 Final Adjustment Shop	ERT-936
N31.01 Insulation Resistance Tester	ERT-936
N31.02 Wheel Load Measuring System	ERT-937
N31.03 Testing Electric Power Supply	ERT-938
N31.04 Tool Cabinet	ERT-939
N41 Shunting Car Shop	ERT-940
N41.01 Shunting Locomotive	ERT-940
N41.02 Shunting Locomotive (Engine Type)	ERT-941
N41.03 Fuel Supply Equipment (Include Fuel Tank)	ERT-943
N51 Not Used	ERT-945
N61 Common Use	ERT-946
N61.01 5-ton Forklift Truck	ERT-946
N61.02 3-ton Forklift Truck	ERT-947
N61.03 5-ton Cargo Truck	ERT-948
N61.04 Rescue device	ERT-949
N61.05 Vehicle (Van)	ERT-951
N71 Tools	ERT-952
N71.01 Measuring Instruments, Gauges	ERT-952
N72.02 General Tools	ERT-953
Part B South Depot	ERT-956

S01 Light Repair Shop	ERT-956
S01.01 Cleaning Set	ERT-956
S01.02 Air Blow Booth with Dust Collector	ERT-957
S01.03 Insulation Resistance Tester	ERT-958
S01.04 Battery Charger	ERT-959
S01.05 Filter Washing Machine	ERT-960
S01.06 Double Head Grinder	ERT-961
S01.07 Upright Drilling Machine	ERT-962
S01.08 Disc Cutter	ERT-963
S01.09 Welding Machine	ERT-964
S01.10 Oxygen Acetylene Gas Welder	ERT-965
S01.11 Air Compressor (Include Air tank)	ERT-966
S01.12 Forklift Truck 2t	ERT-967
S01.13 Work Table	ERT-968
S01.14 Tool Cabinet	ERT-969
S01.15 Rack System	ERT-970
S01.16 High-Pressure Water Cleaner	ERT-971
S02 Un-Scheduled Repair Shop	ERT-972
S02.01 10/3t Overhead Travelling Crane	ERT-972
S02.02 Bogie Replacing Equipment	ERT-973
S02.03 Underfloor Equipment Exchange Device 2t	ERT-975
S02.04 Movable Lifting Platform	ERT-976
S02.05 Boarding Step	ERT-977
S02.06 Welding Machine	ERT-978
S02.07 Oxygen Acetylene Gas Welder	ERT-979
S02.08 Work Table	ERT-980
S02.09 Tool Cabinet	ERT-981
S02.10 Bogie Transport Equipment	ERT-982
S02.11 Car Body Lifting Jack	ERT-983
S03 Wheel Re-Profiling Shop	ERT-985
S03.01 Underfloor Wheel Re-profiling Lathe	ERT-985
S03.02 Jib Crane 1t	ERT-988
S03.03 Work Table	ERT-989
S03.04 Tool Cabinet	ERT-990
S03.05 Baby Compressor	ERT-991
S04 Carbody Washer	ERT-992
S04.1 Automatic Car Body Washer	ERT-992
S41 Shunting Car Shop	ERT-995
S41.01 Shunting Locomotive (Both Rail and Road Drive Type)	ERT-995
S51 Not Used	ERT-996
S51.01 Not Used	ERT-996
S61 Common Use	ERT-997
S61.01 Not Used	ERT-997

	S61.02 Not Used	ERT-998
	S61.03 Not Used	ERT-999
	S61.04 5-ton Cargo Truck	ERT-1000
	S61.05 Rescue device	ERT-1001
	S61.06 Vehicle (Van)	ERT-1003
	S71 Tools	ERT-1004
	S71.01 Measuring Instruments, Gauges	ERT-1004
	S71.02 General Tools	ERT-1005
9.	Training Facility at Training Center	ERT-1007
9.1	General	ERT-1007
9.2	Requirements	ERT-1007
10.	Platform Screen Doors	ERT-1018
10.1	Scope of Work	ERT-1018
10.2	Design Criteria and Standard	ERT-1023
10.3	Design Requirements	ERT-1024
10.4	Control and Monitoring	ERT-1031
10.5	Structural Integrity and Durability	ERT-1033
10.6	Architectural Requirements	ERT-1034
10.7	Testing, Commissioning, and Verification	ERT-1036
10.8	Operation and Maintenance Support	ERT-1040
10.9	Interfacing Requirements with Civil	ERT-1042
11.	Computerized Maintenance Management System	ERT-1050
11.1	Scope of Work	ERT-1050
11.2	Abbreviations	ERT-1053
11.3	Design Criteria, Applicable Standards, and Codes	ERT-1054
11.4	System Description and Performance Requirements	ERT-1055
11.5	Interface Requirements	ERT-1064
11.6	DRACAS Database	ERT-1066
12.	Integrated Operations Control Center and Depot Control Center	ERT-1070
12.1	Introduction	ERT-1070
12.2	Scope of Works	ERT-1070
12.3	Design Requirements	ERT-1071
12.4	Control Center Layout	ERT-1073
12.5	Workstation General Functionality	ERT-1074
12.6	Control Room Design, Materials Finishes and Facilities	ERT-1074

SECTION VI - EMPLOYER'S REQUIREMENTS

a) SCOPE OF WORKS (SOW)

Employer’s Requirements

a) Scope of Works (SOW)

1. General

The purpose of this document is to provide the Scope of Works (SOW) for the Contractor for the E&M Systems and Track Works. A detailed description of the SOW is provided in Part 2- Employer’s Requirements – Section VI – Employer’s Requirements, which are subdivided into General Requirements (ERG) and Technical Requirements (ERT).

The SOW consists of both Malolos Clark Railway Project, hereinafter shown as ‘MCRP’ and North South Railway Project - South Line (Commuter), hereinafter shown as ‘NSRP-South’, connecting with North South Commuter Railway, hereinafter shown as ‘NSCR’ with mutual through train operation. The MCRP commences at Clark International Airport and connects to the NSCR at Malolos. The NSRP-South connects with the NSCR at 200m south of Solis Station and continues to Calamba with a connection to the Metro Manila Subway Project hereinafter shown as “MMSP” at Bicutan. The NSRP-South also includes the spurs from Blumentritt and Solis stations to Tutuban Station. At the connections with NSCR and MMSP, the E&M systems and track work shall be fully integrated to ensure full seamless interoperability between the various rail services. Depots will be located in Mabalacat on the MCRP and at Banlic on NSRP-South. The mainline runs predominantly on viaducts with the Clark International Airport and the approach tracks being in tunnels.

It should be noted that the power supply and distribution systems as well as the overhead contact line system shall be sized based on the ultimate rolling stock fleet and timetable. The sizes of the equipment, cables, and conductors, etc. stated within the ERT are for indication only and shall be supplied to suit the actual operational requirements established by detailed simulations. The power supply systems shall be designed for maximum power efficiency and economy.

2. Scope of Contract

The Contract shall include the design, supply, manufacture, delivery, integration of systems, installation, testing, and commissioning of all equipment and systems required for the efficient operation and maintenance of this project all in compliance with the outline design described in the Employer’s Requirements and Drawings.

This Contract includes the following parts:

- a) Track Works for the mainline and depots.
- b) Signaling System for the mainline and depots.
- c) Telecommunications for the mainline and depots.
- d) Power Supply system at the substations.
- e) Power Distribution System at the stations, between stations and depots.
- f) Overhead Contact line System for the mainline and depots.
- g) Automatic Fare Collection System
- h) Depot & Workshop Facility at the depots.
- i) Training Facility at training center
- j) Platform Screen Doors at stations
- k) Computerized Maintenance Management System
- l) Integrated Operations Control Center.

The Employer will not provide any equipment or free issue materials to the Contractor. The Contractor shall be responsible for the provision of all equipment and materials that is required for his construction activities and the tests.

3. Outline of Track Works

The outline of track works is as follows:

- a) Track works for MCRP and NSRP-South consist of mainline tracks, approach lines to the depot, and depot tracks.
 - b) For the viaduct sections of the mainline continuous welded rail is used. The precast sleeper with elastic fastenings is to be directly fastened on the concrete trackbed with shear connectors provided by civil contractors.
 - c) For the embankment sections of the mainline, the same elastic pre-cast sleepers are to be directly fastened on the concrete trackbed. There shall be drainage slope and shear connectors provided by the civil contractors.
 - d) For the depot area, jointed rails shall be used. The pre-cast sleeper with elastic fastenings are laid on a ballast layer for the stabling tracks. The directly fastened track on the column or wall of the pit or the embedded track on the concrete floors are to be adopted for the inspection tracks, vehicle maintenance tracks, and vehicle washing tracks. Other types of tracks will be selected according to the function in the depot area.
 - e) Turnouts on the mainline shall use plastic/FFU sleepers directly fastened to the concrete track. Turnouts in the depot shall be will be installed on FFU sleepers.
 - f) The track gauge is the standard 1435mm with 60 kg/m rail for the mainline and depot approach lines and JIS50N rail for the depot areas.
 - g) A operation speed of 160km/h is to be applied on some parts of the MCRP with the remainder of the mainline having an operation speed of 120km/h.
 - h) Track mounted maintenance vehicles.
- System details are described in ERT.

4. Outline of Signaling System

The outline of the Signaling System is as follows;

- a) Signaling system is to be based on ETCS level 2 with a maximum speed of 160 km/h
 - b) Signaling System works together with Automatic Train Protection System (ATP), Train Detection System, Computer Based Interlocking System, Automatic Traffic Supervision System as a minimum and provision for Automatic Train Operation (ATO).
 - c) Onboard equipment for Commuter, Limited Express, and MMSP Rolling Stock plus maintenance vehicles.
 - d) All Cables, Cable Containment and supports for the system.
- System details are described in ERT.

5. Outline of Telecommunications

The outline of the Telecommunications is as follows;

- a) Backbone System
- b) Radio System
- c) Dispatcher Telecommunications
- d) Voice and Data Radio System
- e) CCTV System
- f) Passenger Information and Flight Information Display Systems
- g) Public Address
- h) Time Server and Master Clock System
- i) Meteorological and Seismic Monitoring System
- j) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

6. Outline of Power Supply System

The outline of the Power Supply Systems is as follows;

- a) Substations, battery posts, and sectioning posts for the mainline and in the depots.
- b) Power will be supplied from traction substation (TSS) to the train through an Overhead Contact line System (OCS) and to other facilities through a 6.6kV loop Distribution system (PDS).
- c) 69kV power shall be provided by electric utility companies (MCRP).
115kV power shall be provided by MERALCO (NSRP-South) except for TSS1 which is supplied at 34.5kV.
- d) SCADA System for TSS's, overhead contact line system, and electrical equipment.
- e) Solar Panel power generation for selected stations and depots.
- f) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

7. Outline of the Power Distribution System

The outline of the Power Distribution Systems is as follows;

- a) Distribution cable network installation on the mainline and in depots
- b) Works at station electrical rooms and high voltage electrical room in the depots
- c) Distribution of power to equipment for train operation, station equipment, etc.
- d) All Cables, Cable Containment and supports for the system.

System details are described in ERT.

8. Outline of the Overhead Contact Line System

The outline of the Overhead Contact line Systems is as follows;

- a) Feeder-Messenger Catenary System in mainline and Simple Catenary System at Depot
Installation of a catenary system suitable for train operation speed of 160km/h on sections of the MCRP and operational speed of 120km/h for the other areas.
- b) Overhead Line Inspection Vehicles
System details are described in ERT.

9. Outline of Automatic Fare Collection System

The outline of the Automatic Fare Collection Systems is as follows;

- a) The Design, Manufacture, Delivery, Installation, System Assurance, Testing and Commissioning of the AFC system.
- b) The AFC system of MCRP and NSRP-South shall use a contactless IC card that is inter-operative with the existing LRT 1, LRT 2, MRT 3, and the new NSCR and MMSP lines.
- c) Interface works between Level 3 AFC system with the Central Clearing House System and the Card 1st Issuer to undertake the integration of common ticketing and business rules into the AFC system.
- d) The AFC system performance shall conform to the AFC National Standard and the Business Rules.
- e) The AFC system shall include the ticketing system for Limited Express trains for the airport service.
- f) The AFC system shall be robust, flexible, and capable for future extensions and interchanges.
- g) All Cables, Cable Containment and supports for the system.
System Details are described in ERT.

10. Depot Facilities

The outline of the Depot and Workshop Facilities are;

- a) Installation of equipment for Depot and Workshop shall include the following as a minimum:
 - i Equipment to support Preventive Maintenance activities;
 - ii Equipment to support Corrective Maintenance activities;
 - iii Equipment to support Major Overhaul activities;
- b) All Cables, Cable Containment and supports for the system.
Systems details are described in ERT.

11. Outline of Training Facilities at Training Center (MCRP)

The outline of Training Facilities is as follows;

- a) Train Operation Simulators
- b) Track Work
 - i Elastic Sleeper Directly Fastened Track
 - ii Ballasted Track
 - iii Simple Turnout
- c) Signaling System
 - i Equipment in OCC
 - ii Equipment in Stations
 - iii Ground equipment including radio equipment
 - iv Onboard equipment including radio equipment
- d) Telecommunications
 - i Equipment for Network System (Miniature)
 - ii Radio equipment
 - iii PID equipment
 - iv CCTV equipment
 - v PA equipment
- e) Power Supply System
 - i Equipment at Substation
- f) Overhead Contact line System
 - i Support structure
 - ii Catenary
 - iii Various equipment
 - iv Tool
- g) AFC System
 - i Automatic Gate
 - ii Ticket Vending Machine
 - iii Point of Sales equipment
 - iv Handheld Terminal
 - v Station Accounting Computer System
 - vi Central Computer System
- h) Pantograph and Bogie Assembly

The CP NS-02 and CP NS-03 Contractors will prepare and supply the following equipment:

 - i Pantograph for Limited Express and Commuter trains
 - ii Bogie-assembly for motor-car including traction motor, gearbox, and coupling as for Limited Express and Commuter trains.

- 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

b) GENERAL REQUIREMENTS (ERG)

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Employer’s Requirements

b) General Requirements (ERG)

1. APPLICATION OF THE GENERAL REQUIREMENTS

1.1. General

- 1.1.1. These General Requirements (ERG) are part of the Employer’s Requirements and form part of the Contract. The provision contained in the Technical Requirements (ERT) and the Employer’s Drawings shall prevail over the provisions contained in the General Requirements. The provision contained in the General Requirements shall prevail over the provisions contained in the Republic of the Philippines standards, Japanese standards, international standards, and similar standards documents stated in the Contract.
- 1.1.2. These General Requirements shall be read in conjunction with the General Conditions (GC), the Particular Conditions (PC), the Technical Requirements (ERT), and the Employer’s Drawings (ERD) and any other documents forming part of the Contract.
- 1.1.3. All of the Plant and Materials intended to form or forming part of the Permanent Works shall be new.
- 1.1.4. The Contractor shall always immediately seek advice from the Engineer in the event of conflicts between the provisions in the documents.
- 1.1.5. The Employer’s Drawings assist the scope of the Works in general and clarify constraints, interface arrangements, and the conceptual nature of the finished system outline. The Contractor shall carefully check all Employer’s Drawings and advise the Engineer of discrepancies, omissions, errors or ambiguities should any be found.
- 1.1.6. The Contractor shall note that any drawings included but marked “For information only” do not form part of the Contract. Dimensions shown on the Employer’s Drawings are indicative only. The final dimensions shall be determined by the Contractor.

1.2. Definition and Abbreviations

- 1.2.1. In addition to the words and expressions defined in the General Conditions and the Particular Conditions, further following words and expressions shall have the meaning assigned to them except where the context otherwise requires:

“approval, approve, approved” when conveyed, given or undertaken by the Engineer or the Employer shall be deemed to mean only that the Engineer or Employer (as the case may be) has no objection to the Contractor’s deliverable, submittal, request, etc., and it shall not under any circumstances constitute a waiver nor relieve the Contractor of any of its duties, responsibilities, obligations or liabilities under the Contract, since ensuring full compliance with the Employer’s Requirements and the provisions of the Contract shall be deemed to be solely the responsibility of the Contractor under all and any circumstances;

“As-Built documents” means the As-Built Drawings and records submitted during completion of Construction such as inspection and test records.

“As-Built Drawings” means those drawings produced by the Contractor and endorsed by it as true records of construction of the Permanent Works and which have been agreed with the Engineer.

“Capital Spares” means those items which are expected to remain in operation and not require replacement until well beyond the end of the 2-year O&M period and which, because of the length of time it would take to get a replacement for such items, could cause a prolonged shutdown if they had to be replaced. The provision of these items is not included in the Accepted Contract Amount and, if required, shall be ordered by the Employer under separate purchase orders not forming part of the Contract. The applicable purchase rates shall nonetheless be those committed to by the Contractor under this Contract, which rates shall remain valid for a period of one year after the end of the Defects Notification Period

“Commissioning” means the process of setting to work the complete transportation system through a series of integrated tests that demonstrate the installation and performance in accordance with the specified criteria.

“Critical Path Method Network” means a networked project implementation program, usually depicted diagrammatically in bar chart form, that contains a logically connected sequence of interdependent activities each having no float, running from the planned start date through to the anticipated finish date, and which results in the longest overall duration for achieving completion of the project.

“Defect Notification Period” means the period during which the Contractor is responsible to remedy any defective work which becomes apparent during the Defect Notification Period (DNP).

“Designer” means who is responsible for the design of permanent works.

“Design Package” means the drawings, documents, structural analysis, simulation and calculation, test reports, etc. prepared by the Contractor.

“External Interfacing Parties” means those parties with whom it is the Contractor’s responsibility to co-ordinate the design of the Contract Works with; and includes all relevant bodies and entities, in particular government authorities, departments and regulatory bodies utility companies, and the consultants, Project Management Units and contractors of adjacent Projects whether ongoing or planned. The Contractor shall identify such interfacing parties in his Interface Management Plan (IMP).

“Execution of the Works” means the manufacture, supply, transportation, delivery to Site, construction, erection, installation, testing, commissioning, performance testing, completion, and training in the use of the Works in accordance with the Contract; the preparation and/or delivery (as appropriate) of all information, drawings and manuals in respect of the Works required by the Contract, the provision of such spare parts, consumables, tools, and spare materials as are required by the Contract to be provided by the Contractor for the performance of its Defects Liability obligations, and the management of all such matters.

“Factory Acceptance Tests” means the tests to be performed at the Contractor’s factories prior to delivery to the Site to verify compliance with the Technical Requirements and quality standards.

“Final Design” means the design developed to the stage where all manufacturing drawings are fully defined and specified.

“Installation Tests” means the tests to be performed to verify the conformity of completion of an installation/assembly to the design documents previously given a Notice of No Objection by the Engineer prior to the start of Commissioning. Installation Tests do not form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer’s Taking Over of the Works or any

Section however they must be successfully completed before the Tests on Completion can commence.

“Integrated Testing and Commissioning” means those tests that demonstrate the integration of the complete transport system meeting the requirements of the Technical Requirements in an operating environment. Integrated Testing and Commissioning form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer’s Taking Over of the Works or any Section. Test Running is part of the Integrated Testing and Commissioning (ITC) following completion of Partial Acceptance Test and System Acceptance testing etc. The O&M Concessioner can join the Employer in witnessing these tests.

“Interface Contractor” means a Contractor, engaged by the Employer, which are undertaking works on the other NSCR-Ex Contract Packages. The Contractor shall identify all such Interface Contractors in the Interface Management Plan.

“Key Personnel” means individuals who are considered by the Engineer to be critical for the Execution and completion of the Works in accordance with the Contract and as listed as such in the Contractor’s Organization.

“O&M Spares” means all those items that the Contractor has advised the Employer will need to be replaced during the O&M period since they do not have longevity beyond two years. The cost of all such items shall be deemed to be included in the Accepted Contract Amount. If any items not included in the list of “O&M Spares” fail during the O&M period and are not capable of being satisfactorily repaired, they shall be treated as defects and must be replaced by the Contractor as soon as reasonably possible, all at no extra cost to the Employer.

“Railway System”: is a general name showing the system consisting of sub-systems; in Track Works, Signaling System, Telecommunications, Power Supply System, Power Distribution System, Overhead Contact line System, Depot facility, and AFC.

“Rolling Stock Gauge” means the maximum profile within which the rolling stock may be constructed or loaded.

“Software maintenance” means activities on debugging, improvement, modification, or replace of software.

“Spare Parts” means those items with a known short operational life that are required to be replaced during the O&M period in order to ensure that there will be no interruption whatsoever due to the failure of such items in the operation of the Permanent Works after handover to the Employer.

“Structure Gauge” means the profile related to the designated normal coordinated axis of the track into which no part of any structure or fixed equipment may penetrate.

“Technical Requirements” mean the requirements set out in Part 2, Employer’s Requirements, Section VI, Technical Requirements (ERT).

“Taking Over” means the point where the Contract Works or any part thereof has passed all relevant tests and can be Taken-Over by the Employer in accordance with Contract Conditions notwithstanding the Contract Works may have certain outstanding works to be completed but nonetheless such will not affect the Employer’s beneficial use of the Contract Works or part as intended by this Contract.

“Temporary Facilities” means the facilities constructed by the Contractor for his own use or for the use of the Employer or the Engineer during the Construction

period which are not intended to become part of the permanent works.

“Temporary Works” means all temporary works of every kind (including, without limitation, false-work, temporary structures, temporary earthworks, and other things), and the goods, materials, and other constituent parts forming or intended to form a part thereof, required for the Execution of the Works but does not include Contractor's Equipment.

“Testing and Commissioning Spares” means all those spares that may be required to ensure that, after all, testing and commissioning work has been completed (including all “Integrated Testing and Commissioning” work), and prior to taking over by the Employer, the work to be taken over is in full compliance with the Employer’s Requirements and is ready to go into operation. The cost of all such items shall be deemed to be included in the Accepted Contract Amount.

“Tests on Completion” means the tests which are specified in the Contract or agreed by both Parties which are carried out before the Works or a Section (as the case may be) are taken over by the Employer.

“Works Program” means the Contractor’s Works program, showing the sequence, design, manufacture, delivery to Site, erection, construction, installation, testing, commissioning of the Contract Works and related activities in the form and content prescribed by the General Requirements (ERG) and Technical Requirements (ERT), or any amended or varied version thereof, as submitted by the Contractor and approved by the Engineer in accordance with the Works Requirements.

- 1.2.2. A common abbreviation used in the ERG and the ERT are set out in alphabetical order in Appendix 1 attached hereto.
- 1.2.3. Further abbreviation may be defined within the body of the ERG or the ERT where there is only local applicability.

2. MOBILIZATION

2.1. Contractor’s Mobilization Program

No more than 28 calendar days after the Commencement Date the Contractor shall submit a mobilization program to the Engineer for his review.

The program shall include a schedule noting the anticipated arrival of all Railway System construction equipment and facilities as well as the arrival of all-key Contractor’s Personnel and Subcontractors.

The mobilization program shall include a layout plan noting the location, size, and arrangement of all Temporary Facilities for the Contractor, including site office, stores, security fencing, entrance and exit gates, sewage and water lines systems, electrical supply, access, and facility roads.

The program shall clearly list all activities requiring the Engineer’s input and reflect any agreements regarding responses outside the standard response time.

The program shall include but not be limited to mobilization of staff, procurement of facilities, information required from the Engineer and deliverables to be submitted.

A narrative that clearly states any assumptions made by the Contractor, any items that the Contractor identifies as being at risk, and any action required to be undertaken by the

Engineer shall support the Mobilization Program.

2.2. Mobilization Requirements

Mobilization shall consist of preparatory and execution works and operations, including but not necessarily limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the work site; for the establishment of offices, buildings, and other facilities necessary to commence work on the Project; and for other work and operations which must be performed, or costs incurred prior to beginning work on the various contract items on the project site.

Mobilization shall include providing submittals as detailed in Appendix 4 and elsewhere in this document. This will include the proposed Organization Chart that shall be submitted for approval by the Engineer.

The Contractor shall complete construction of all Temporary Facilities for the Contractor and mobilization of all Key Personnel, equipment, and plant in such a time frame that the start and progress of works is not delayed due to late mobilization.

3. TEMPORARY FACILITIES FOR THE CONTRACTOR

3.1. General

3.1.1. This section describes the minimum Temporary Facilities with required infrastructure that will need to be provided by the Contractor for the Works. These include, but are not necessarily limited to the provision and maintenance (including all reasonable operating costs) of:

- (1) Site offices, huts, workshops, warehouses, and stores;
- (2) Temporary utilities such as water, electricity, and sewage connections;
- (3) mobile and fixed; Telephones, internet access,
- (4) sanitary, and medical facilities;
- (5) Enclosures, access roads, and fencing;
- (6) Safety procedures for the Contractor's rail traffic and compliance with requirements of the Particular Conditions;
- (7) Provision of an operation and control system for vehicle movements within the site of rail-mounted equipment;
- (8) All necessary police, highway, and utility approvals or authorizations necessary for the Temporary Facilities and controls;
- (9) Material transportation facilities inside the Contractor’s site facilities, like cranes, lifting plant and machinery, with their foundations, rooms, etc. as required;
- (10) Other facilities related to site transportation;
- (11) Road vehicles for material transportation, site transportation, and Work vehicles;
- (12) All equipment to be assigned to the Temporary Works including requirements for ladders, planks, hoists, scaffolding, and similar items;
- (13) Security for the whole of the worksite from access to the commencement of Trial Running.

The Contractor shall use all means necessary to maintain the Temporary Facilities and control in proper and safe condition throughout the progress of the Works, moving as required during the construction of the Works and remove the same from the Site on completion of the Works and ensure that the area is left free of debris, excess materials, and obstructions.

The minimum major Temporary Facilities for the Contractor are described below.

3.2. The Contractor’s Site Offices

The Contractor’s site office shall be provided within or in the vicinity of the work site with all necessary facilities including furniture, office equipment, office supply, utilities services, sanitary systems, etc.

Adequate parking space for the vehicles shall be provided at the site offices.

3.3. Contractor’s Labor Accommodation and Camps

The Contractor shall supply, equip and maintain for the Contract period all his own living accommodation, sheds, and stores necessary for the execution of the Work, and shall make his own arrangements with the owners of any land required and, if necessary, pay for its use.

The accommodation shall comply with the appropriate Government Regulations, and standards like the National Building Code, Republic of the Philippines. No dwelling shall be constructed with non-insulated metal walls, Thatch will not be permitted. Married Quarters as necessary shall be provided in the Contractor's camp. All hutments and buildings shall be adequately equipped furnished. The Contractor shall also construct and maintain adequate roads or paths to all hutments and buildings.

All hutments and buildings must at all times be open to inspection by the Engineer and officers of the public health authorities and any instruction given for the proper cleaning, disinfecting and general maintenance in a building must forthwith be carried out by the Contractor.

Temporary living accommodation for the use of watchmen and a limited number of workers and emergency personnel may be provided by the Contractor within the Site. The accommodation shall be kept clean and hygienic at all times.

The Contractor shall supply, equip and maintain facilities as necessary for the living accommodation such as providing separate living quarters and toilet facilities for men and women personnel, feeding and welfare of its employees by providing, servicing, and maintaining a camp at the Contractor’s Main Site Office or other sites as necessary.

3.4. Warehouse/ Store

The Contractor shall have on the Site a suitable workshop, adequately equipped and provided with utilities, to allow for repairs of the equipment employed to carry out the Works. He shall also provide a warehouse for spare parts for his equipment mainly for the parts that frequently fail or are difficult to procure. A chief foreman qualified for mechanical repairs, with an adequate labor force must manage the workshop.

The Contractor shall provide, erect, construct and equip all offices, workshops, stores, sheds, loading and unloading facilities and the like required by him, complete with all machines and equipment and all services, access roads, rail tracks and the like, required by him for the site depot, in consultation with the Engineer.

3.5. Vehicles

The Contractor shall provide all necessary road vehicles for material transportation at the site depots like trucks (with cranes), trailers, and cars. Vehicles shall also be provided by the Contractor for site transportation of labor where necessary.

Furthermore, the Contractor may also provide road-rail vehicles such as track-type (with cranes), etc. where required for cable laying, material transportation at the sites, etc.

Competent licensed drivers shall be appointed for all the vehicles and the vehicles shall be well maintained throughout the Contract including during the Defect Notification Period.

3.6. Utilities for Temporary Facilities

3.6.1. Water

All water required for and in connection with the equipment and plants, devices, dust control, for settling of backfill material, or for any other use as may be required for proper completion of the Works, shall be provided by and at the expense of the Contractor. No separate payment for water used.

3.6.2. Temporary Power and Lighting

- (1) Temporary power shall consist of temporary power for construction operations and temporary lighting.
- (2) The Contractor shall provide all power for operation of his plant and equipment, or any other use, including cooling and lighting of buildings for use by the Engineer.
- (3) The Contractor shall arrange with the utility company to provide and pay for the service required for power and lighting.
- (4) The Contractor shall provide temporary lighting for all work areas and buildings, to protect the Works and maintain suitable working conditions. Temporary lighting shall be maintained in all areas under the control of the Contractor.
- (5) The Contractor shall provide and install circuit and branch wiring, with area distribution boxes located so that power and lighting are available throughout the construction site.
- (6) Standby Generators with a suitable capacity shall be furnished by the Contractor to cope with the cases of power supply cut-off.

3.6.3. Air Conditioning

The temporary facilities shall be equipped with air conditioning units to provide climate control to the temporary facilities.

3.6.4. Telephone

The Contractor shall make all necessary arrangements and pay all costs for operation

and installation and usage charges of telephone service to the Contractor's offices at the site.

3.6.5. Internet

The Contractor shall provide the necessary arrangement and pay all costs for operation and installation and usage charges of the internet service to the Contractor's offices at the site.

3.6.6. Sanitation

The Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project. Sanitary facilities shall be of sufficient capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. The Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

Separate sanitary facilities for male and female personnel shall be of sufficient capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. The Contractor shall provide separate sanitary facilities accessible to male and female workers. The Contractor shall ensure that the ratio of fixtures for male and female sanitary facilities is 1:2.

3.6.7. Drainage

- (1) The Contractor shall construct and maintain at his own cost a system of surface drainage and waste disposal. Sanitary conveniences for the use of persons employed on the Project shall be provided and maintained by the Contractor in accordance with the appropriate laws and regulations in force in the Republic of the Philippines. All persons connected with the Project shall be obliged to use them.
- (2) For any sudden floods that may occur, pumping and dewatering shall be carried out by the Contractor.

3.6.8. Fire

- (1) The Contractor shall construct, equip and administer at his own cost fire control points in such positions and of such size as will provide an adequate service for the protection against fires on work areas and buildings, stores, and properties on the Site.
- (2) He shall provide and maintain a proper warning system to ensure that fire-fighting equipment can be concentrated on a fire before it has had time to spread.

3.7. Maintenance of Temporary Facilities

The Contractor shall keep all offices, stores, and other areas set up during the Contract clean and litter-free. The Contractor shall be responsible for dealing with all forms of vermin at the Site during the Contract to the satisfaction of the Engineer and in accordance with local authority requirements. The Contractor shall be responsible for maintenance costs and charges arising from the facilities provided or used by him and the Engineer site supervision staff until completion of the Contract.

3.8. Damage to Existing Property

The Contractor will be held responsible for any damage to existing structures, works, materials, or equipment because of his operations or the operations of any of his

Subcontractors. The Contractor shall repair or replace any damaged structures, works, materials, or equipment to the satisfaction of the Engineer, and at no additional cost to the Employer.

The Contractor shall be responsible for all damage to streets, roads, railroads, curbs, sidewalks, highways, shoulders, ditches, embankment, culverts, bridges or other public or private property, which may be caused by the transport of equipment, materials or people to or from the Works.

3.9. Access to Temporary Facilities Sites

The Contractor shall construct entry and exit roads to/from and around all Temporary Facilities. Entry and exit points should be accessible to all personnel, including those with disabilities and those who might find themselves handicapped at any point in the project's development.

Security fencing shall be constructed around all Temporary Facilities. Fencing shall be provided with lockable gates at each entry and exit point.

Suitable external lighting shall be provided at the entrance to all buildings.

3.10. Additional land for Construction Purposes, Detours, Plant and Other Uses

The Contractor shall acquire, if needed, additional working areas in the vicinity of the Works or elsewhere for his camp, yard, for the storage of equipment, for his own office buildings, housing, quarters, stores, plant yard, workshops, offices, and any additional areas required for construction purposes and access or other uses.

Before entering the working site, the Contractor shall give written notice to the Engineer. The Contractor shall give separate notices for each owner and occupier or authority having charge over the working sites.

Before entering any additional working areas, the Contractor shall obtain, and forward to the Engineer, a copy of the written consent of the owner and occupier or authority having charge over the land and stating the purposes for which such land is to be used. The Contractor shall define the extent and periods of occupation for which such consent is granted.

The Contractor shall select, arrange for, and if necessary, pay for the use of sites for construction purposes, detours, plant, and other uses necessary for the execution of the Works.

Before any land belonging to the Government or a private landowner is used for any purposes in connection with the execution of the Work, the Engineer's approval shall be obtained.

Prior to placing the facilities in any area, all clearing and grubbing operations shall be to the satisfaction of the Engineer. The ground elevation of all temporary facilities shall be a minimum of 20 cm above the adjacent existing ground. The surface shall be adequately sloped to allow rainwater to adequately drain.

If any utility for water, electricity, drainage, etc., passing through the temporary site will be affected by the Works, the Contractor shall, at his own expense, provide a satisfactory re-alignment or alternative in full working order to the satisfaction of the owner of the

utility and the Engineer, before the cutting or removal or relocation of the existing utility.

On completion of the Contract, or earlier if so directed by the Engineer, all plant, Temporary Facilities, and any other encumbrances shall be removed, the site and land use areas shall be properly cleaned, all damage made good, and, if necessary, the land-owner paid for the use of the land.

4. PROJECT MANAGEMENT BY THE CONTRACTOR

4.1. Contractor's Management Plans

- 4.1.1. In order to ensure satisfactory execution of the Contract, completion of the Works within specified time, and quality in design, manufacturing, and execution of work, a series of Contractor’s Management Plans shall be developed.
- 4.1.2. The plans and documents shall be coordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organization, and sequencing of activities to meet the requirements of the Employer’s Requirement - Technical Requirements (ERT) in respect of the subjects listed.
- 4.1.3. The respective Plans shall be submitted for the Engineer’s Approval as per the submission schedule furnished in Table 4-1 of Appendix 4 attached hereto.
- 4.1.4. All Plans shall be updated and resubmitted at an interval of between 6 to 12 months as approved by the Engineer.

4.2. Project Management Plan

- 4.2.1. The Contractor shall submit a Project Management Plan, which shall provide a clear overview of the Contractor's organization, the management system, and methods to be used for completion of the Works. The organization resources for the design, procurement, manufacture, installation, testing and commissioning, and setting to work, shall be clearly defined.
- 4.2.2. The Contractor shall submit the Project Management Plan for the Engineer’s Approval as per schedule of Table 4-1 of Appendix 4 attached to hereto. The Engineer will review the Contractor's Project Management Plan and will have the right to require the Contractor to make amendments as deemed necessary. The Contractor shall submit a detailed revised plan within 15 days of the review of the Engineer. The Project Management Plan shall include;
 - (1) A diagram showing the organizational structure for the management of the Contract, with locations, names, and position titles of Key Personnel and their line and staff relationship. The diagram shall include associate organizations and subcontractors and show clearly the individuals and lines of responsibility linking the various groups. It shall also identify the persons designated as contacts with the Engineer. All Key Personnel and those holding senior positions, as designated by the Engineer, shall be given a Notice of No Objection prior to their engagement and mobilization. Approval may be withdrawn at any time in the event of incompetence, non-performance, or misconduct. Any person so removed shall be replaced without delay by a substitute given a Notice of No Objection by the Engineer. The Contractor shall not be entitled to any claim for any expenses whatsoever incurred by him in respect of any direction given by the Engineer under this Clause nor any claim for extension

of time arising from this Clause. All Key Personnel shall be employed on a full-time basis until the issuance of the final Taking Over Certificate or such other time as the Engineer may instruct.

- (2) The names, qualifications, positions, and current resumes of key executive, supervisory, and engineering staff to be employed full-time for the works, separately for principals and subcontractors.
- (3) A narrative describing the sequence, nature, and inter-relationship of the main Contract activities including timing for exchange of information.
- (4) The Deputy Project Manager shall coordinate activities of the design offices and manufacturing works. The Deputy Project Manager shall be responsible to the Project Manager for all works executed outside the Republic of the Philippines and in the Republic of the Philippines for ensuring that effective coordination is maintained with the various manufacturing units of the Contractor, Subcontractors, and Interface Contractors and that contract delivery schedules are met.
- (5) The Project Manager shall, be on-site in the Republic of the Philippines and devote himself full-time to the Project, commencing not later than 30 days after the Commencement Date.
- (6) To fulfill the Contractor’s obligations during the Testing and Commissioning and the Defect Notification Period, the Contractor shall nominate experienced engineers and organize deployment after obtaining the Engineer’s Approval before undertaking testing and commissioning in depot and track.
- (7) The contractor shall engage staff with the requisite professional licenses and certification to undertake the duties to which they have been assigned.
- (8) The Key Personnel and those holding senior positions, as designated by the Engineer, shall be employed on a full-time basis until the issuance of the Taking Over Certificate (or such other time as the Engineer may instruct).

4.3. Interface Management Plan

- 4.3.1. In order to ensure seamless railway systems, the Contractor shall prepare an Interface Management Plan detailing their approach to interface management and coordination with interfacing contractors and third parties e.g., utility providers.
- 4.3.2. Interfacing Contractors shall include but not be limited to the following:
 - (1) Package CP N-01: Viaduct Structure and 2 Stations
(Bridge Works, Calumpit and Apalit Stations Works: 34KM+749 to 51KM+670)
 - (2) Package CP N-02: Viaduct Structure and 1 Station
(San Fernand Stations Works: 51KM+670 to 67KM+440)
 - (3) Package CP N-03: Viaduct Structure and 2 Stations
(Angeles and Clark Stations Works: 67KM+440 to 79KM+560)
 - (4) Package CP N-04: Railway Structure and CIA Station
(Viaduct/At Grade/ Tunnel/ CIA Stations Works: 79KM+560 to 86KM+177)
 - (5) Package CP N-05: Depot Building and Civil Works
 - (6) Package CP NS-03: Rolling Stock – Limited Express Trainsets
 - (7) Package CP NS-02: Rolling Stock – Commuter Trainsets
 - (8) Package CP S-01: Viaduct Structure and 1 Stations

- (9) Package CP S-02: Railway Structure and 4 Stations
- (10) Package CP S-03a: Railway Structure and 3 Stations
- (11) Package CP S-03b: Railway Structure and 1 Stations
- (12) Package CP S-03c: Railway Structure and 2 Stations
- (13) Package CP S-04: Viaduct Structure and 2 Stations
- (14) Package CP S-05: Viaduct Structure and 4 Stations
- (15) Package CP S-06: Viaduct Structure and 3 Stations
- (16) Package CP S-07: Depot Building and Civil Works
- (17) Independent Safety Assessor (ISA)
- (18) Package CP01: Elevated Structures, 7 Stations and Depot;
- (19) Package CP02: Elevated Structures, 3 Stations
- (20) Package CP03: Rolling Stock;
- (21) Package CP04: E&M Systems and Track Works
- (22) Package CP05: Elevated Structures, 1 station.
- (23) Package CP107: Rolling Stock for MMSP;
- (24) Package CP106: E&M System and Track Works for MMSP;
- (25) Package CP101: Civil work and Depot for MMSP;
- (26) Packages CP102,103,104,105 and 108 Civil work for MMSP
- (27) O&M Concessionaires.
- (28) 3rd Party Interfacing parties such as authorities, utility companies, and other Stakeholders.

4.3.3. The Contractor shall develop and submit for the Engineer’s Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto, an Interface Management Plan, The Interface Management Plan shall include:

(1) Scope

Interface management and coordination arising from this contract, with interfacing contractors and third parties.

(2) Interface Management Organization

The contractor shall be responsible for all aspects (Liaise, Interface Identification, Technical Solution, Complementary studies, Implementation planning) of interfacing with third parties.

The Contractors organization shall be such to guarantee timely integration and coordination with other systems and civil works.

(3) Deliverables

a. Interface Matrix

The Contractor shall systematically identify all interfaces and list these interfaces with a brief description and naming of the interface counterparts in an Interface Matrix regardless of the contractual relationship. This Interface Matrix is a live document and shall be update regularly.

b. Interface Agreement

Each Interface must be described with an Interface Agreement which shall define the authority and responsibility of the Contractor and Interface Contractors (and any relevant subcontractors) staff involved in the interface management and development;

Define the information to be exchanged, precise division of responsibility between the Contractor and Interface Contractors, implementation planning (to be compliant with base line program) and integrated tests to be performed at each phase of the Contractor's and Interface Counterparts' works; and

“Child” requirements as a result of interfacing shall be listed in the Interface Matrix.

The Engineer shall review such Interface Agreement and comment with justified observations.

c. Meetings

The contractor shall regularly chair meetings. The frequency shall be adjusted to an as need basis.

(4) Requests for Information

The contractor shall use RFI's (Request for Information) for clarification or to escalate an interface resolution.

4.4. Works Program

4.4.1. Programming Software and Structure of Programs

- (1) Programming software to be used shall be Primavera P6 (Release 16 or later). The program submission shall be in both hard copy and soft copy. Electronic copy shall be in the compatible template with Primavera Cloud. All Programs shall be prepared in terms of durations of days and weeks from the Commencement. “Day” used throughout the contract shall mean “calendar day” and “Week” shall mean “calendar week”. All programs shall be developed as critical path networks, and the Critical Path shall be clearly shown in the bar charts or networks. All programs should be submitted with standard Activity Reports (showing Times, Floats, etc.) and Narrative statements, explaining the programs. A Time Chainage Program shall be prepared using Tilos 7.0 (or latest version) or similar which allows import and export of linear works program with Primavera P6.
- (2) All programs shall be developed by computerized Critical Path Method (CPM) network using the Precedence Diagramming Method (PDM) and shall be presented in either bar chart or time-scaled network diagram format, suitably colored to enable easy reading. The Critical path shall be clearly marked on the bar charts and networks. Cost and resource loading will be done on the program only if the Engineer asks for it.
- (3) Details of the program structure are given in Appendix 2 attached hereto.
- (4) The Contractor shall be responsible for teaching programming software to the Employer’s staff who are monitoring the progress of the Works.
- (5) During the initial mobilization period, the Contractor shall provide the Engineer with four (4) complete sets for each of these software packages (refer to item (1) shown

above) together with all documentation, standalone licenses, and maintenance contracts covering the full duration of the Project from Commencement Date to the issue of the Performance Certificate. The Contractor shall arrange the installation of these software packages as directed by the Engineer.

4.4.2. Different Program Submission Requirement

(1) Program

The Contractor shall submit a program that shall clearly and concisely demonstrates completion of the Milestones and Key Dates and also the whole of the works by the Time for Completion specified. All the programs shall be compatible with each other and shall be in sufficient detail to assure the feasibility of the Contractor's approach to meet the contractual obligations.

(a) Design Submission Program

This shall cover the design phase and include a schedule identifying, describing, cross-referencing, and explaining the design packages and submissions which he intends to submit. It should take due account of the design co-ordination interface periods with other Interface Contractors, as planned by the Contractor. The design stages should be clearly identified and the appropriateness of design sequence and correlation with manufacturing activities established.

The Design Submission Program should take due account of the design coordination interface periods with other Interface Contractors and be consistent with the Works Program.

(b) Works Program

This shall indicate how the Contractor intends to organize and carry out the Works and achieve stages and complete the whole of the Works by the Time of Completion. The Works Program should also meet the milestones of the Contract. The shipment schedule of major components shall be provided as part of the Works Program.

The scheduling approach to the design, manufacture, delivery, installation, testing, and commissioning, integrated tests and any other required tests, and their inter-relationships shall be shown in the Works Program. These shall contain sufficient detail to enable a clear and concise evaluation of the Contractors intentions.

The narrative statement shall also indicate which elements of the Works the Contractor intends to carry out off-shore and/or in the Republic of the Philippines, with details of the proposed locations of where any such work is to be carried out, the facilities available and any third party undertaking the Contractor may have in this regard. In particular, the Contractor must state the assumptions made in respect of the interfaces with the Employer, the Engineer, other contractors, and third parties both in detail and time, and any requirements for information on matters, which would affect his works.

(c) Time Chainage Program

This shall indicate all Key Dates and Access Dates in the contract documents and identify potential interface milestones with other Contractors if these are not be specified in the contract document. It should include all the major activities from

mobilization, site preparation, construction, installation, and testing & commissioning along the alignment.

It should be prepared based on the general approach and method of installation. The construction direction and sequence of works shall be consistent. The planned resources and construction rate should be applied to associated activities.

For the specific works, which are not linear, in the depot, station, and substation, shall be prepared separately (if necessary) and summarized in the overall Time Chainage Program.

(2) Post - Contract Programming Requirements

After the contract award, the Contractor shall submit:

a) Detailed Time Program (Baseline Program)

The Contractor shall develop and detail out his Design Submission Program and Works Program submitted in a Detailed Time Program (including Detailed Works Program and Detailed Design Submissions Program), within 28 days after the Commencement Date. This should incorporate suitable modifications as per the requirements of the Engineer, and amendments to take into account the work of other interfacing contractors.

The program shall make provision for the time required for review procedures, determining and complying with the requirements of all those, whose consent, permission, authority, and license is required prior to the execution of any work.

The Contractor shall note that at the time of submission, his Programs have yet to be coordinated with the other Interface Contractors. These shall not prevent the Contractor from submission of programs using approximate dates for work of the other Interface Contractors (where such dates are not available), which has an impact on the other Interface Contractor's programs. Such programs shall be amended subsequently to take into account the actual schedules of the other Interface Contractors. It is the Contractor's responsibility to ensure timely coordination with all the Interface Contractors to finalize his programs so as not to affect the progress of the Works or those of the Interface Contractors.

The Detailed Time Program shall be reviewed by the Engineer within 21 days. Additional re-submission and review may be required as per the Conditions of Contract. Upon acceptance of the program by the Engineer and the Employer, the Detailed Time Program shall be deemed as “Baseline Program”, against which the progress of the Works shall be measured.

b) Time Chainage Program

This should be updated and submitted with the Detailed Time Program. It will serve as a general guideline for all site activities. Detailed construction program, if required by the Engineer should be developed and aligned to all the start and finish dates in Time Chainage Program. aa

4.4.3. Baseline Program Updating and Revisions

As the Works progresses, it may be necessary for the Contractor to update the Baseline Program, based on the approved variations, actual dates, and progress, but such updating shall only be carried out in accordance with GC8.3 or on the instruction of the Engineer or when directed by the Employer. Any revised program and supporting report shall describe the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within Time for Completion. No revisions shall be made to the contract completion date, except as authorized by the Employer, and as authorized under the Contract. Each revision of the Baseline Program should be submitted with an updated Time Chainage Program if the site activities are adjusted to meet the original or revised completion dates.

4.4.4. The Contractor may be asked to submit by the Engineer, subprograms of a particular portion of the Work or other programs like, what-if programs showing different options, based on work requirement.

4.4.5. It should be noted that once trial operations commence and operation control is undertaken by the O&M concessionaire then there will be restrictions to access the sections which are in his operational control and duration during which works can be undertaken. Works should be planned and undertaken in accordance with these restrictions.

4.5. Quality Assurance Management Plan

4.5.1. The supplying Contract shall be executed within the framework of an efficient quality system. The international standard ISO 9001 is the standards of reference for the QA requirements applicable to the Contractor’s (or subcontractor’s) activities:

- (1) Design,
- (2) Manufacturing,
- (3) On-site activities.

4.5.2. The Contractor shall submit an Outline Quality Assurance Management Plan, illustrating the intended means of compliance with the Employer’s Requirements and setting out in a summary form an adequate basis for the development of the more detailed document. The Outline Quality Assurance Management Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the Contractor’s quality objectives with regard to the requirements of the Contract. Details about Quality Assurance Management Plan to be followed are given in Appendix 5 attached hereto.

4.5.3. The Contractor shall prepare the Quality Assurance Management Plan in detail and carry out the works subject to it.

4.5.4. The Quality Assurance Management Plan submitted to the Engineer for Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto, shall contain sufficient information to demonstrate clearly the proposed method of achieving the quality objectives with regard to the requirements of the Contract.

4.5.5. The Quality Assurance Management Plan shall indicate the approach and structure that the detailed plan will take and shall include the following:

- (1) A summary of the project requirements including all proposed quality activities;

- (2) All quality assurance and quality control procedures proposed by the Contractor for his use in the execution of the Works;
 - (3) A list of all the codes of practice, standards, and specifications that the Contractor proposes to apply to his work; The Contractor shall provide the Engineer and Employer a hard and soft copy of any Standard or Code of Practice referenced in any submission or as may be required in the execution of the works. Should the Standard or Code of Practice be in another language other than English then an English translation shall be provided;
 - (4) The Contractor's proposals for internal and subcontractor quality assurance audits; and;
 - (5) A statement detailing the records that the Contractor proposes to keep, the time during which they will be prepared and the subsequent period and manner in which they will be stored;
 - (6) Quality Control Points and Quality Hold Points during verification, surveillance, tests, trial, and commissioning activities;
 - (7) Procedure for maintenance of records of inspection/tests.
- 4.5.6. The Quality Assurance System shall be applied without prejudice to, or without in any way limiting, any Quality Assurance System that the Contractor already maintains.
- 4.5.7. The Contractor shall maintain the Quality Assurance Management Plan updated during the course of the execution of the Contract. All amendments to the original and approved Quality Assurance Management Plan shall be notified to the Engineer. The quality plan shall comprise:
- (1) A Management Quality Plan for control of management related activities;
 - (2) A Design Quality Plan for control of design-related activities;
 - (3) A Manufacturing (including Inspection and Testing) Quality Plan for the control of related activities;
 - (4) Testing and Commissioning (including Integrated Testing and Commissioning) Quality Plan.
- 4.5.8. The Contractor shall submit a detailed organization chart identifying the responsibilities, authority, and interrelation of all personnel who manage, perform, and verify work involving quality in respect of all the Quality Plans. The organization chart shall be specific to this Contract. The chart shall identify the Quality Management Representative who shall act as the Quality Coordinator for the Contractor in all dealings with the Engineer.
- 4.5.9. The Contractor shall audit all the activities in each Quality Plan at quarterly intervals or other such intervals as the Engineer may require ensuring the continuing suitability and effectiveness of the quality management system. The Contractor shall make available upon request any document, which relates to his recent internal audits.
- 4.5.10. The Engineer will require compliance audits of the Contractor's and suppliers' quality system to be conducted. Not less than two (2) weeks a notice will be given by the Engineer. During audits, the Contractor shall provide suitably qualified staff to accompany the auditors.

4.5.11. All suppliers and subcontractors used by the contractor shall be given a Notice of No Objection prior to the commencement of the manufacture and commencement of their works. A detailed submission for each supplier shall be made which shall include as a minimum, scope of works, company organization, experience in supplying product or service, and quality management systems. Supplier familiarization visits, Quality Inspections at the manufacturer’s facilities, First Article inspections, Type Tests, Routines Tests, and Factory Acceptance Tests shall be undertaken for all material and equipment to be supplied for this contract. For all these inspections and tests a maximum of four people will attend from the Employer and Engineer. All costs associated with these inspections either offshore or onshore including transportation, accommodation, insurances, expense, etc. for the Employers and Engineers staff shall be borne by the Contractor.

4.5.11.4.5.12. Equipment that has been tested and approved for unconditional and unrestricted use on any passenger-carrying railway by any Railway administration may be exempted from fresh type approval test by the Engineer. However, for this exemption a viable certificate issued by the concerned Railway administration must be submitted to the Engineer for verification and acceptance. The Engineer’s decision will be final.

4.5.12.4.5.13. Prior to any Quality Inspections, First Article inspections, Type Tests, Routines Tests and Factory Acceptance Tests, all submissions related to the inspections and tests shall be given a Notice of No Objection.

4.5.13.4.5.14. Prior to the start of any construction activities or the installation of any equipment, a mockup shall be constructed which shall be given a Notice of No Objection by the Engineer and shall be used as the standard for all future installation. The items to be included in the mockups and the locations of the mockups shall be agreed with the Engineer.

4.6. System Assurance Management Plan

4.6.1. The Contractor shall submit, within 45 days from Commencement Date of the Works, a comprehensive System Assurance Management Plan (SAMP), as per the requirements of the Contract, for the Engineer’s Approval.

4.6.2. The Contractor shall carry out the system assurance activity based on EN50126, JIS Standard, IEC62278, or internationally accepted equivalent. The SAMP and program shall be certified by the Contractor’s internal department or by a third-party independent engineer from the design and manufacturing sector. The SAMP shall be specifically developed for this Contract. The SAMP shall address Reliability, Availability, Maintainability, and Safety (RAMS). This shall ensure the E&M Systems has a high degree of reliability and minimized downtime.

4.6.3. The SAMP shall also include a configuration management tracing system. This system shall be in place throughout the contract to ensure that all deliverable items of equipment are of the same configuration. All changes to equipment and configuration change control processes shall include the phases of configuration identification, control of changes, and configuration verification.

4.6.4. The SAMP shall ensure that the E&M Systems are designed and developed to:

- (1) Be safe, with either proven operational evidence or have adequate evidence-based justifications for their use;

- (2) Be safe including proven electromagnetic compatibility;
- (3) Be certified for revenue service;
- (4) Be reliable;
- (5) Be optimized for maintainability;
- (6) Have high levels of inherent availability.

4.6.5. This plan is intended to provide the basis for integrating system assurance across the Project, leading to the achievement of safety certification and the delivery of world-class RAM performance across the project.

4.7. Site Safety Management Plan

- 4.7.1. The Contractor shall submit a Site Safety Management Plan, which shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures in the installation, assembling, testing, and commissioning of the Railway Systems. The Site Safety Management Plan should include an outline of the safety procedures and regulations to be developed and the mechanisms by which they will be implemented for ensuring safety requirements, site safety, and transportation of Railway System equipment.
- 4.7.2. The Outline Site Safety Management Plan shall be headed with a formal statement of policy in relation to safety and shall be sufficiently informative to define the Contractor’s Site Safety Plan and set out, in summary, an adequate basis for the development of the site safety.
- 4.7.3. The Contractor, its Sub-Contractors and suppliers of any tier and all employees performing any part of the Contract Works on the Site shall comply in every aspect with the provisions of any relevant statutory regulations, procedures manuals, and notices and/or with requirements of Philippines law as may be considered applicable to the Works or “The Guidance for Management Safety for Construction Works in Japanese ODA Project”, September 2014, Japan International Cooperation Agency (JICA), whichever is the more onerous.
- 4.7.4. The Contractor shall submit a Site Safety Management Plan for the Engineer’s Approval as per the schedule of Table 4-1 of Appendix 4 attached hereto. The Site Safety Management Plan shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures and solutions in the installation, assembling, testing, and commissioning of the Railway Systems.

The Site Safety Management Plan shall contain, but not limited to, details of the following:

- (1) A policy statement signed by the top management of the Contractor, declaring that the Contractor shall ensure that safety and health are given the highest priority in all aspects of the Works.
- (2) The statutory and contractual obligations regarding safety and health imposed on the Contractor, and the means by which the Contractor shall supervise, monitor, and audit his site safety assurance system to ensure due compliance with these obligations.
- (3) Site organization structure for safety staff, which shall identify personnel to be

engaged solely on-site safety assurance purposes and shall list their responsibilities;

- (4) The powers vested in the Safety and Health Manager and other safety staff which would enable them to take urgent and appropriate action to make safe the Site and accident prevention practices.
- (5) Emergency procedures and rescue teams. The Contractor shall formulate emergency procedures and organize rescue teams to deal with emergencies on the Site.
- (6) Procedures during typhoons and heavy rainstorms, and emergency organization to maintain safety on Site during typhoons and heavy rainstorms;
- (7) Methods of promoting awareness of site safety and health amongst all persons directly or indirectly associated with the Works.
- (8) The frequency, coverage, and application of accident prevention and safety management courses. All workmen and supervisory staff shall be required to attend a safety induction course before they are allowed to commence work on Site, and thereafter at intervals of not more than six (6) months.
- (9) An accountable record of all trained persons shall be kept by the Contractor. Each individual who has successfully completed training shall be given a unique identity card (ID).
- (10) The safety equipment which will be required for the Works, including the quantity, sourcing, standards of manufacture, storage provisions, and means of ensuring proper and where appropriate mandatory utilization by all workmen and staff employed directly or indirectly by the Contractor.
- (11) Protection of authorized visitors and prevention of entry of unauthorized persons to Site;
- (12) Records to be prepared and maintained by the Safety Officer and safety staff. The records shall include all examination reports and test certificates required under the relevant regulations.
- (13) Regulations and procedures covering all safety and health aspects of the Contract, including but not limited to the following, where applicable:
 - 1) Housekeeping
 - 2) Traffic control and transportation
 - 3) Fire control precautions and Fire procedures
 - 4) Working on the Operation Railways
 - 5) Excavation
 - 6) Welding, cutting operations and equipment
 - 7) Electrical equipment
 - 8) Personnel protection clothing and equipment
 - 9) Lifting cranes, hoists, and other lifting appliances
 - 10) Scaffolding and work platforms
 - 11) Hand tools and portable power-driven tools
 - 12) Structural steel erection
- (14) This Plan shall consider the role of O&M Concessionaire during the staged opening for passenger service; particularly constraints that the O&M concessionaire may impose on sections that are in his operational control. For example, the possibility of restricted access curtailed work durations, etc.

Terms of reference, membership, and frequency of meetings of site safety working groups;

A comprehensive site safety and health checklist which when completed shall serve to record whether the Contractor complies with his statutory and contractual obligations at the time of the inspection.

- 4.7.5. Security of the railway operation shall be the first priority in the Site Safety Management Plan because the accident will cause significant disaster. It should draw attention to the following point, (1) Safety for Works in the Vicinity of Existing operating PNR lines; (2) Safety for Third-Party Disaster that the residents connecting to NSRP-South will concern; (3) Safety for prevention of railway accidents that the working personnel of the works will execute their procedure for. The detail for these three aspects of the Safety Plan are given below:

(1) Safety for Works in the Vicinity of Existing Operating PNR lines

Any adjacent works shall be restricted in order to ensure safety during the train operation. This restriction also includes the use of construction equipment such as backhoes, mobile cranes, and tracked loaders. The use shall not infringe the construction gauge of PNR’s rolling stocks during their operation at any time. Where that equipment will be required to work in and on an area of the construction gauge, the manipulation of the equipment shall be conducted within non-traffic window time of the train operation.

Restricted activities in the vicinity of the PNR lines shall be carefully planned and applications for permission to carry out the restricted activities shall be submitted to the PNR. The restricted activities shall only be carried out after permission is obtained from the PNR and the Engineer. The provisions and approval requirements as stipulated by PNR shall be followed.

Construction activities within the railway protection and safety zones shall be considered restricted activities in the following cases:

- 1) The movement or operation of any crane, whether fixed or mobile, hoist, ladder, drilling or piling equipment, excavator, or any other mechanical equipment or vehicle;
- 2) The installation of boreholes, wells, sheet piles, pile foundations, ground anchors, and horizontal tie-backs;
- 3) The storing and placing, or causing or allowing the storage or placement of, any goods, material or thing or any solid, liquid or gaseous matter or substance;
- 4) The digging or excavation of trenches or pits, the carrying out of earthworks and backfilling, or the shifting or pushing of earth or soil from one area to another, whether or not such activities are carried out manually or by mechanical means;
- 5) The erection of poles, offices, sheds, warehouses, workshops, shelters, tents, scaffolding, maintenance towers, ladders, hoardings, and other similar temporary structures; and
- 6) The use of explosive material for the purpose of blasting, demolition, or removal of rocks.

The slope face of cut and embankment works shall be properly protected so that collapse due to the works will not happen during or after their construction. This protection will ensure to avoid collision between collapsed material and operational rolling stocks and to prevent the obstruction on track rails that causes derailment. It is essential that a

proper retaining wall prevents the collapse of an excavated ditch/pit that may damage an adjacent rail roadbed structure.

Where temporary storages of the construction material and equipment are adjacently located along the railway track, proper clearance between the storages and track shall be kept. This clearance means allocating the storage out of the area of a roadbed level in principle. If the storage will inevitably overlap the roadbed level, the storage shall also be considered that stored goods will not interfere with the train operation in case of a load collapse and scatter.

(2) Safety for Third Parties

It is essential that the hoarding will isolate the construction works from any third party interfacing with MCRP. The hoarding will consist of existing PNR’s fencing and supported by temporary barriers such as crowd control and traffic barrier. These temporary barriers would be arranged at locations that the third-party individuals could easily enter the works site. Such entry points should be equipped with noticeable information boards and picket guards to ensure that individuals entering the site are well informed.

The traffic diversion for the loading and unloading of materials/equipment into site premises shall be managed in safe manner. The traffic diversion shall consist of traffic barriers, markings, signs, and impact attenuators as necessary. In addition, the traffic personnel shall guide construction working vehicles and direct traffic flow on the road. The management plan of this traffic diversion shall also include obtaining consent from the relevant authorities to mitigate the traffic jam due to the relevant works.

Any utilities that will be affected by the construction works shall be protected. This protection shall comply with the regulations of the relevant authorities such as electricity, telecommunication, water supply, sewerage, gas, and the lands owned by PNR itself. Before executing the protection works, each alignment condition shall carefully be identified with visual inspections and official registers. Especially, underground lines shall ensure the identification accompanied by the trial trench if that alignment condition would be controversial between the record and on-site conditions. This trial trench should also observe to detect abandoned lines with surveillance of the relevant authorities.

(3) Safety organization for prevention of railway accidents

The security organization for the works in the railway roadbed level shall be established in accordance with PNR’s safety regulation. This organization provisionally assigns the following responsible personnel:

- 1) A Superintendent who is responsible for this organization for the prevention of accidents. He is obligated to arrange preventive measures and communicates with the relevant department such as stations, operation controls, and maintenance in case of emergency.
- 2) A Foreman who is responsible for the safety instruction and working procedures of their laborer,
- 3) A Railway Watchman who is responsible of the approaching/passing train to motion the personnel for confirming their perception and evacuation, and
- 4) A Laborer who is instructed to execute the works by the superintendent/foreman considering the safety precautions such as the railway track entry, site ambulation, track crossing, prohibition of solo works, and evacuation from the

approaching/passing train.

Railway watchmen shall be assigned in full service at each working site, and this deployment shall also relay information of the approaching/passing train through intermediate one where the direct sight could be impractical. Before starting the works, the deployed watchman shall motion the superintendent/foreman about their readiness. Once the train has been perceived, the watchman shall repeat their motion until the personnel will reply to their perception and evacuation. Then the watchman shall motion the rolling stock operator for a clearance on the track is safe.

The measures for an abnormal case, where accidents may happen, shall immediately be taken with the train protection communicating with the relevant department in order to obey its direction. It should prevent railway disaster with any sort of the following train protection.

- 4.7.6. The Contractor shall erect temporary safety fences and hoarding to prevent unauthorized access to its work sites and to the railway during the works train operation. The design of fences and hoarding, and material use therein shall Site Safety Management Plan be given a Notice of No Objection by the Engineer before starting installation.
- 4.7.7. The Contractor shall designate a member of his staff as a Safety Officer in addition to the Safety Manager. The Contractor shall maintain a First Aid Post at all times when personnel are on Site. First Aid Boxes shall be maintained in a fully equipped state at all times. The Contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering first aid competently until the arrival of professional help, in an accident situation.
- 4.7.8. The Contractor shall be fully responsible for the safety of the Works, his personnel, his subcontractors’ personnel, the public, and any persons directly or indirectly associated with the Works, or on or in the vicinity of the Site. The Contractor shall treat safety measures as high priority in all his activities throughout the execution of the Works.
- 4.7.9. The Contractor shall submit to the Engineer, regular Site Safety Reports, and shall notify immediately the occurrence of an accident involving his staff or that of his subcontractors, or to any person within the area of the Site for which the Contractor is responsible.
- 4.7.10. Other training should include:
 1. Conduct/Ethics/Behavioral Coaching
 2. Gender-Based Violence (GBV) and Sexual Harassment (SEAH) Awareness and Response Training
 3. HIV-AIDS Awareness and Response Training
 4. Other relevant training that the Employer and Engineer may deem necessary.

Employment status should include monitoring of the above-mentioned training content compliance.
- 4.7.11. The Contractor shall be responsible for all matters related to the safety health and welfare of its Sub-Contractors and suppliers of any tier and all employees performing any part of the Works on the Site, and shall comply in every respect with the provisions of all relevant statutory regulations, procedures, manuals, and notices and with all requirements of the Philippine laws as are applicable, including but not limited to:

- (a) ADB recommendations to DOTr concerning COVID-19 dated 21st May 2020:
- (i) World Health Organization. 2020. Considerations for Public Health and Social Measures in the Workplace in the Context of COVID-19. Geneva.

<https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19>
 - (ii) Government of the United Kingdom. 2020. Working Safely During COVID-19 in Construction and Other Outdoor Work: Guidance for Employers, Employees and the Self-Employed.

<https://assets.publishing.service.gov.uk/media/5eb961bfe90e070834b6675f/working-safely-during-covid-19-construction-outdoors-110520.pdf>
 - (iii) The Canadian Construction Association. 2020. COVID-19 – Standardized Protocols for All Canadian Construction Sites.

<https://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf>

4.8. Software Quality Assurance Management Plan

- 4.8.1. The Contractor shall submit a Software Quality Assurance Management Plan for the Engineer’s Approval as per schedule of Table 4-1 of Appendix 4.
- 4.8.2. The Software Quality Assurance Management shall include the cybersecurity and threat management, the transfer of relevant software copyrights and intellectual property rights.

4.9. Risk Management Plan

- 4.9.1. The Contractor shall produce a Risk Management Plan (RMP) in accordance with ISO 31000 and/or PMI-Standard Practice for Project Risk Management. The Risk Management Plan shall describe how the Contractor intends to:
 - (1) integrate risk management into the team culture, planning, construction activities, and decision-making processes;
 - (2) Anticipate and respond to the changing nature of the works, social, environmental, and regulatory requirements proactively;
 - (3) Mitigate risks pragmatically to a level that is As Low As Reasonably Practicable (ALARP) given the particular circumstances of each situation;
 - (4) Implement a robust and sustainable risk register that is created, maintained, and managed in accordance with the Risk Management Plan, and
 - (5) Ensure consistency and uniformity for all project risk mitigation measures as well as providing a basis for the review and control of the mitigation measures.
- 4.9.2. The Contractor shall, within twenty-eight (28) days of the Commencement Date, prepare and submit to the Engineer his Risk Management Plan in accordance with Clause 4.10.1

- 4.9.3. The Contractor shall, within 30 days of the commencement date and at all times throughout the duration of the Contract, engage at least one Risk Management Representative to be employed and based full time on the Project. The Contractor shall submit the Risk Representative's CV and credentials to the Engineer for approval.
- 4.9.4. The Risk Management Representative shall be suitably qualified (minimum degree qualification in Risk Management or railway/construction/risk related subject) and ideally shall have at least ten (10) years of experience in risk management at a minimum level of Assistant Manager.
- 4.9.5. The Risk Management Representative shall be employed solely on project risk management activities.
- 4.9.6. Risk Organization Structure
- (1) The Contractor shall establish an effective risk management reporting structure to enable structured communication in managing and supporting the risk management process.
 - (2) The Contractors senior site representative (Project Manager or equivalent) shall be responsible for the overall risk management function.
- 4.9.7. Project Risk Management Process
- 4.9.8. The Contractor shall implement a risk management process which shall:
- (1) Identify risks and their associated impact(s) on the Works in terms of design, technical, procurement, constructability, health & safety program, cost, third parties, financial, reputation and political risk along with operational risk, natural event risk, human factor risk and environmental risk & impacts;
 - (2) Analyze risks by estimating the probability of their occurrence and the time and cost impact of each risk event;
 - (3) Minimize the impact of risks on the project objectives through the identification and implementation of appropriate risk mitigation measures;
 - (4) Allocate risks to the most appropriate risk owner and risk Actionee to implement the risk mitigations, and
 - (5) Evaluate the success or otherwise of the implemented risk mitigations and establish the need for further action until the risk can be closed out.
- 4.9.9. Risk Identification
- (1) Within thirty (30) days from the submission date of the Contractors RMP, the Contractor shall undertake an initial risk workshop to consider all associated risks on the Contract and to populate the Contractors risk database. Following the initial populating of the Contractors risk database, the Contractor shall be responsible for the regular updating and use of the risk database as a management tool.
 - (2) The Contractor shall review and update the risks stored in the risk database regularly (at least once every month) to ensure that the risk information is current.
 - (3) The Contractor shall systematically identify all possible risks which have a

potential impact on the Project.

4.9.10. Risk Workshops

- (1) The Contractor shall schedule and attend regular monthly risk workshops to identify, review, and report on risks associated with delivery of the Contract and to continually update his risk database.
- (2) The risk workshops shall be led by a competent member (ideally Project Director) of the Contractor team who has experience in the construction methods proposed and in risk management and shall be facilitated by the Contractor's Risk Management Representative. Other Contractors management staff, including risk owners, and where appropriate, sub-contractors and or other technical specialists who are involved in daily construction activities, shall be required to attend the risk workshops.
- (3) The Contractor shall invite representatives from the Engineer and Employer to attend each risk workshop to assist and actively participate in risk identification and the review and development of associated risk mitigation measures.

4.9.11. The Contractor will utilize Active Risk Manager (ARM), a web-based project risk database, and provide two user licenses for the Engineer and one for the Employer. The Contractor shall maintain a record of all identified risks and issues and opportunities, including their status and history, in the risk database. The Contractor shall be responsible for updating and maintaining the risk database on an ongoing basis throughout the Contract duration.

4.9.12. Treatment of Risks

- (1) The Contractor shall minimize the impact of risks on the project through the identification and carrying out of appropriate mitigation actions. Risk mitigations shall be SMART i.e. specific, measurable, attainable, realistic, and time-bound.
- (2) Risk mitigations recorded in the risk database shall be complete, unambiguous, and sufficient to reduce the risk level So Far As Is Reasonably Practicable (SFAIRP). The risk mitigations shall also be described in sufficient practical detail so that they can be readily understood.
- (3) Risk mitigations for each individual (single) risk shall be allocated to a risk owner, who shall be a staff member of the Contractor, and who shall be responsible for ensuring that the mitigation measures identified on that risk are completed as required.

4.9.13. Risk Monitoring and Control

- (1) Through the monthly risk workshops the Contractor shall review the current risk exposure and as appropriate the probabilities of occurrence and associated impacts.
- (2) Through the monthly risk workshops, the Contractor shall actively monitor the implementation of risk mitigation measures. Any necessary changes to previously agreed mitigations shall be recorded in the risk database.

4.9.14. Risk Close Out

- (1) Residual project risks are defined as those project risks that have a probability of occurrence greater than zero and could affect future railway operations. The Contractor shall use the risk closeout process to identify residual project risks for handover to the Employer at the completion of the handover phase of the Project.
- (2) The Contractor shall submit to the Engineer for approval its Project Risk Close-Out Register before issuance of the Taking Over Certificate. The Project Risk Close-Out Register shall form one of the conditions precedents to issuance of the Taking Over Certificate.

4.9.15. Risk Management Audits

- (1) The Engineer may undertake audits on the Contractor to assess the effectiveness of their implementation of risk management activities as stated in the Risk Management Plan and on the policy and procedures as set out in the Contract. Audits will be conducted once every six (6) months throughout the duration of the Contract.
- (2) Following each audit, a formal audit report will be issued by the Engineer for the Contractor to respond to and take any necessary corrective or preventative actions. Should there be any unsatisfactory observations or non-conformances identified during the audit, the Contractor shall propose to the Engineer, for approval, corrective/preventive actions, together with an appropriate closeout date, within 14 days after receiving the audit report.
- (3) The Engineer will approve the proposed corrective actions and verify and accept the proposed corrective/preventive actions by the Contractor. Subsequently, the Engineer will verify the evidence for closure of the unsatisfactory observation/NCR during the next audit.
- (4) The Engineer will inform and may invite the Employer to attend and observe the audit sessions.

4.10. COVID-19 Risk Management Plan

- 4.10.1. The Contractor shall submit a COVID-19 Risk Management Plan to safeguard all people on Site through a monitoring, education, and PPE approach. Application of the COVID-19 Risk Management Plan shall comply with DPWH Department Order No. 39, 2020 issued 19th May 2020 or any successor to the Order.

4.11. Environmental Management Plan

- 4.11.1. The Contractor shall submit an Environmental Management Plan illustrating the intended means of compliance with the Republic of the Philippines’s standards, law, ordinance, and other regulations on the environment and the Employer’s Requirements. The Environmental Management Plan shall also contain sufficient information to demonstrate clearly the proposed method of achieving the environmental objectives with particular reference to air, water, noise, vibration, and waste.
- 4.11.2. The Contractor shall submit, within 60 days after the Commencement Date, a detailed and comprehensive Environmental Management Plan to the Engineer for approval. The Environmental Management Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the environmental objectives with particular reference to air, water, noise, vibration, and waste together with a monitoring plan. A

Noise and Vibration Analysis Report shall be submitted as part of the Environmental Management Plan. The Contractor shall also comply at all times with any other mandatory requirements, local safety, security, Project Environmental Impact Statement (EIS) report, and other regulations in force and to which the Works are subject, including any requirements specified by the fire brigade.

- 4.11.3. The provisions listed herein regarding environmental protection shall apply to and be binding upon the Contractor for any works on the Site and the persons employed by Subcontractors. The Contractor shall ensure that proper and adequate provisions to this end are included in all Subcontracts placed by him. These provisions shall not be applicable in the case of emergency works necessary for saving of life and property or safety of the Contract Works.
- 4.11.4. The Environmental Management Plan (EMP) shall include the technological approaches which aim to implement an efficient, effective, practical and economical application of the technologies in order to prevent, eliminate or control the negative impacts. Example of the environmental management efforts through the technological approaches are:
- (1) Control air and noise pollution as affected by the operation of heavy-duty equipment in the construction phase;
 - (2) Anticipate the occurrence of erosion and landslides from earthworks;
 - (3) Control the quality of surface water as well as underground water, as affected by construction works and disposal of liquid wastes;
 - (4) Collect and store used oil and lubrication fluids in a drum;
 - (5) Provide temporary toilets; and
 - (6) Anticipate and control any interruption to traffic stability during the construction.
- 4.11.5. The Contractor should comply with the EMP (Environmental Management Plan) and EMoP (Environmental Monitoring Plan) that are described in the latest version of the EIA report for the MCRP and NSRP-South. The Draft EIA’s requirement for the Contractor’s Environmental Management Plan (construction Stage) are given below in Table 4 -1
- 4.11.6. The Draft EIA’s requirement for Contractor’s Environmental Monitoring (Pre-construction Stage) and Construction stage are given below in Table 4 - 2 and Table 4 - 3 respectively
- 4.11.7. The draft plans are for information only and the contractor is expected to prepare a specific plan based on project-specific requirements.

Table 4 - 1: Draft EIA’s Requirement for Contractor’s Environmental Management Plan (Construction stage)

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
Pollution control	Air pollution	Air pollution caused by emissions of gas from construction machine and vehicle, dust from construction works and materials as well as construction traffic	<ol style="list-style-type: none"> 1) Sprinkling water at construction site 2) Proper storage of construction materials including covering sand and gravel that are easily diffused into the atmosphere 3) Covering bulk materials during transportation 4) Regular maintenance of construction machines and vehicle reduce emissions
	Water pollution	<ol style="list-style-type: none"> 1) Discharging turbid water from construction site 2) Generation of domestic wastewater from temporary construction office or related facilities 	<ol style="list-style-type: none"> 1) Discharging turbid water through sedimentation ponds or after simple turbid water treatment 2) Installation of temporary septic tanks or other wastewater treatment facility for workers
	Waste	<ol style="list-style-type: none"> 1) Surplus soil waste and other waste from construction 2) Waste of existing devices replaced with newly installed devices such as bricks, ballast, etc. 3) Solid and liquid wastes discharged from temporary construction office and other facilities 	<ol style="list-style-type: none"> 1) Reduce, reuse and recycle of construction and other types of waste 2) Disposal of waste in a proper way 3) Installation of temporary sanitation facilities such as septic tank at construction office and other facilities
	Noise and vibration	Impacts of noise and vibration by construction machineries and vehicles	<ol style="list-style-type: none"> 1) Installing noise barrier and selecting low-noise equipment as needed,

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
			<p>especially near the residential area and/or sensitive receptor</p> <p>2) No construction activities with heavy equipment during nighttime if there are any sensitive receptors nearby</p> <p>3) Prior notice of construction schedule near the residential area</p>
	Offensive odor	Offensive odor due to excavation or dredging in drainage channels or creek	Consideration of additional mitigation measures depending on an odor source and condition
Natural Environment	Flora, fauna, and biodiversity	Loss of trees and other plant species	Replanting trees in suitable area as needed based on prior consultation with the relevant administrative authorities
	Hydrological situation/drainage system	Potential impacts on hydrological situation or drainage condition surrounding of MCRP&NSRP-South Line due to improvement of drainage system of MCRP &NSRP-South Line	<p>1) Site patrol</p> <p>2) Consideration of additional mitigation measures if any issues are confirmed</p>
Social Environment	Existing social infrastructure and services	<p>1) Road traffic congestion in the surrounding area during the construction period of level crossing and other facilities</p> <p>2) Inconvenience for PNR</p>	<p>1) Advance announcement of construction schedule</p> <p>2) Preparation and implementation of the Traffic Management Plan by the Contractor including arrangement of watchmen and detour road signs</p>
	Infectious diseases such as HIV/AIDS	Risks for infectious diseases due to inflow of construction workers	Awareness of public health for workers and local communities
	Working condition including occupational	1) Accidents in the operation of construction machinery and other works	<p>1) Compliance with the requirement of Labor Law</p> <p>2) Preparation of a safety</p>

Category	Item	Expected Environmental and Social Impacts	Key Mitigations Measures
	health and safety	2) Risk of occupational health and safety for workers in case of severe working conditions	and health management plan and enlighten occupational safety to workers 3) Providing proper personal protective equipment (PPE) such as helmet, safety jacket, gloves, and safety shoes for workers
Others	Traffic accident	The risk of accidents would be higher for passengers, informal occupants, and other nearby residents due to their habits of crossing railway lines and the land of PNR by walk and occupation on railway yard and the land of PNR with shops, huts, and vendors	Manage the construction site to prevent local people from entering the site by barricading and the site security gate.
	Climate change	GHG emissions from construction vehicles and machines	Saving on electricity in construction sites and offices such as vehicle idle reduction.
	Hazardous materials and oil management	Spoil of fuel or hazardous substance that is used for construction work	Training workers on appropriate handling of fuels and chemicals Measures for spill control and leakage control system

Table 4-2: Draft EIA’s Requirement for Contractor’s Environmental Monitoring (Pre-construction stage)

Category	Key Monitoring Item	Location	Frequency
Common	1) Review and update of the Environmental Management Plan based on the detailed project design 2) Preparation of safety management plan for construction phase	Project area	Once before commencement of construction work

Table 4-3: Draft EIA’s Requirement for Contractor’s Environmental Monitoring (Construction stage)

Category	Key Monitoring Item	Location	Frequency
Common	Progress of conducting mitigation measures	Project area	Monthly and quarterly during the construction period
Air quality	1) Site patrol 2) Checking received complaints from residents 3) Monitoring of air quality	Representative point(s) of construction site(s)	1) Monthly 2) Whenever received 3) When needed
Water quality	1) Site patrol 2) Monitoring of parameters stipulated by National Environmental Quality (Emission) Guideline	Creeks nearby construction site(s)	1) Monthly 2) Biannually
Waste	1) Site patrol and housekeeping at construction site 2) Checking waste-disposal method	Construction site(s)	1) Monthly 2) Monthly
Noise and vibration	1) Site patrol 2) Received complaints from residents 3) Monitoring the noise and vibration level	Construction site(s)	1) Monthly 2) Whenever received 3) When needed
Cutting of trees	1) Check of species and number of trees that need be cut 2) Prior consultation with the relevant administrative authorities in charge.	Construction site(s)	1) Quarterly 2) Once or more
Existing social infrastructure and services	1) Collection of complaints 2) Physical observation of road traffic condition 3) Interviewing/discussing with Traffic Police	Construction site(s) and surroundings	1) Whenever received 2) Every day of the construction period 3) When necessary
Infectious diseases such as HIV/AIDS	1) Received complaints from residents 2) Record of awareness activities	Construction site(s)	1) Quarterly at minimum 2) Quarterly
Working condition including occupational health and safety	1) Site patrol 2) Record of implementing the safety and health management plan	Construction site(s)	1) Monthly at minimum 2) Quarterly
Traffic accident	1) Site patrol 2) Record of accidents 3) Record of safety-awareness campaign and other measures	Construction site(s)	1) Monthly at minimum 2) Monthly 3) Monthly

Category	Key Monitoring Item	Location	Frequency
Hazardous materials and oil management	1) Site patrol to check the condition of handling or storing hazardous materials 2) Record of training on handling hazardous materials for workers	Construction site(s)	1) Monthly 2) Quarterly

4.11.8. The Contractor shall submit, within 60 days from Commencement Date of the Works the following for the Employer’s assessment and approval:

1. Code of Conduct

The Contractor shall furnish a copy of their Code of Conduct which should include specific prohibitions against GBV, and in particular, a prohibition of any sexual activity with children, defined as anyone under the age of 18, residing in the project area. It shall also further define a range of sanctions proportionate to the event, for example, warnings for incidents of community harassment, such as catcalling, versus dismissal for incidents of sexual abuse.

2. GBV Action Plan

A GBV Action Plan, which should include mechanisms, sanctions, and mitigation procedures in handling GBV-related cases during project implementation. The GBV Action Plan must be compliant with the Legal and Policy Framework provided by the Employer. It shall properly address the requirements stated under GC 6.8, 6.9, and 6.11.

The Contractor has the following options in formulating the GBV Action Plan:

- (i) **Sub-Contracting a local GBV Service Provider**
The Contractor has the option to subcontract a local GBV Service Provider to handle GBV-related cases during project implementation. The Contractor shall submit a company profile of their nominated GBV Service Provider as part of the Bidding Documents, for the Employer’s assessment and approval. The nominated GBV Subcontractor must provide items listed in Section (ii), to measure their capacity in handling GBV-related cases for the project.
- (ii) **Formulation of a project-specific GBV Action Plan**
Contractors should demonstrate that they have the capacity to manage GBV risks. For the project’s GBV risks to be properly addressed, it is necessary to have an effective ‘GBV Action Plan’, which outlines:
 - How the project will put in place the necessary protocols and mechanisms to address the GBV risks; and,
 - How to address any GBV incidents that may arise.
The GBV Action Plan needs to include specific arrangements for the project by which GBV risks will be addressed. This includes components such as:
 - Awareness Raising Strategy, which describes how workers and

local communities will be aware and sensitized to GBV risks, and the Employer’s responsibilities under the CoC;

- Policies Governing the Workplace, which details clear policy regarding non-tolerance of sexual harassment in the workplace. These are also expected to be included, as minimum requirements, in the Contractor’s Code of Conduct. Illustrative templates should be developed for these policies.
- GBV Intake Mechanism, which will detail how the Employer will receive GBV-related complaints, data- gathering in relation to the complaints, and the necessary subsequent procedures thereafter;
- GBV Referral Mechanism, to which the Employer will refer GBV survivors to necessary government offices, local police, and other potential sources of further action and services;
- GBV Monitoring and Evaluation Strategy, which describes the safety measures to be implemented for the benefit of monitoring the general condition of the project;
- GBV Allegation Procedures; how the project will provide information to employees and the community on how to report cases of GBV CoC breaches to GRM.

4.12. Inspection, Testing, and Commissioning Management Plan

- 4.12.1. The Contractor shall submit an Inspection, Testing, and Commissioning Management Plan as per schedule of Table 4-1 of Appendix 4 attached hereto, for the Engineer’s Approval as specified in Chapter 9 of this Employer’s Requirement - General Requirement (ERG) and required in the Employer’s Requirement - Technical Requirement (ERT).

4.13. Earthing and Bonding Strategy Plan

- 4.13.1. The Contractor shall submit for approval an Earthing and Bonding Strategy Plan which shall include such items as methods of earthing, separation, resistance values, etc. This document will ensure consistency across multiple Civil and E&M Systems Contractors.

4.14. Review Periods for Contractor's Submissions

- 4.14.1. The Engineer shall review those Contractor's plans, designs, and program submissions which require his Approval or otherwise within 21 days from receipt of the hard copy of the submissions. The Contractor shall re-submit his plans and programs within 14 days of the receipt of the Engineer’s comments.

The Engineer will endeavor to review and respond to the Contractor on the adequacy and acceptability of the Contractor's submissions and re-submissions as soon as reasonably possible, but the Contractor should always allow for a 21- day review period.

The Contractor shall allow in his program a 21-day review period for all submissions to the Engineer.

Any submissions received that do not meet the required quality and content shall immediately be rejected by the Engineer and shall not be subject to review.

4.15. Failure to Make Submissions

- 4.15.1. Failure of the Contractor to submit any plan and program, or any required revisions thereto within the time limits stated shall be sufficient reason for certification that the Contractor is not performing the work required in a timely manner. The Engineer may certify retention of payment under the Milestone-related Cost Center proposed for the Contractor until his plans and programs are accepted/consented by the Engineer.

4.16. Plans and Program Revision

- 4.16.1. The Contractor shall revise his plans and programs whenever necessary, with the consent of, or as required by the Engineer to ensure completion of the Works within the Time for Completion for the Works.

4.17. Planning and Programming Staff

- 4.17.1. The Contractor shall employ sufficient number of planning and programming staff competent in the use of the programming software and with a good knowledge of the type of work required to be performed by the Contractor under the Contract.

The Engineer shall have the discretion to require the Contractor to replace his planning and programming staff if the Engineer considers that they do not have the training or skill required for this specialized nature of work.

4.18. Project Calendar

- 4.18.1. Project Weeks shall commence on a Monday. A day shall be deemed to commence at 0001 hours on the morning of the day in question. Where reference is made to the completion of an activity or Milestone by a particular week, this shall mean by midnight on the Sunday of that week.

4.19. Progress Reporting

- 4.19.1. Progress Reports, as detailed in Appendix 3 attached hereto, shall be regularly submitted by the Contractor, on a monthly basis.
- 4.19.2. The contractor shall submit weekly progress dashboards, one for the overall contract, and other individual dashboards for each railway system. The dashboards shall be accompanied by a detailed Material Control Schedule which tracks and records all material procurement activities. The formats used are to be agreed upon and given a Notice of No Objection by the Engineer.

4.20. Co-ordination and Interface with Interface Contractors and Others

- 4.20.1. The Contractor is responsible for detailed co-ordination of his design, manufacturing, construction, testing and commissioning activities with those of the Interface Contractors and Consultants whether or not specifically mentioned in the Contract, who may be working for the purpose of the Project. The interfaces also cover all works undertaken on adjacent projects such as MMSP and NSCR.
- 4.20.2. The Contractor shall note that there are other contractors, consultants, agencies, etc. which the Employer may engage from time to time, and with whom the Contractor shall have to similarly co-ordinate. Such coordination responsibilities of the Contractor shall include the following, but need not be limited to:

- (1) To provide all information reasonably required by the Interface Contractors in a timely and professional manner to allow them to proceed with their design, manufacturing, construction activities, and to meet their milestones and work program dates, if any.
- (2) To ensure that the Contractor's requirements are provided to all other Interface Contractors, in a timely and reasonable manner.
- (3) To obtain from the Interface Contractors information reasonably required, to enable the Contractor to meet his own design submission dates.
- (4) To ensure close coordination with the contractors in charge of the Signaling System in respect of the provision of Signaling System equipment in the cars and finalizing the interface between the rolling stock and Signaling System equipment.
- (5) Where the execution of the work of the Interface Contractors depends upon the site management or information to be given by the Contractor, the Contractor shall provide to such Interface Contractors the services, or the correct and accurate information required, enabling them to meet their own program or construct their own works.
- (6) To ensure that there is no interference with the works of Interface Contractors.
- (7) To attend regular coordination meetings convened by the Interface Contractors and the Engineer. The Contractor shall conduct separate meetings with the Interface Contractors as necessary to clarify particular aspects of the designated requirements of the Works. A record of the decisions taken in each such meeting shall be furnished to the Engineer. The party who convenes the meetings shall prepare minutes recording all matters discussed and agreed at the meeting.
- (8) To ensure that all correspondence, drawings, meeting minutes, programs, etc. relating to the Contractor's coordination with the Interface Contractors are issued to all concerned parties and four copies issued to the Engineer no later than seven calendar days from the date of such correspondence and meetings.

4.20.3. The Contractor shall, in carrying out his co-ordination responsibilities, raise in appropriate time and provide sufficient information for the Engineer to decide on any disagreement between the Contractor and the Interface Contractors as to the extent of services or information required to pass between them.

4.20.4. If such disagreement cannot be resolved by the Contractor despite having made all reasonable efforts, then the decision of the Engineer shall be final and binding on the Contractor.

4.20.5. Where an Interface Contract is yet to be awarded, the Contractor shall proceed with the co-ordination activities with the Engineer until such time as the Interface Contractor is available. The Contractor shall provide the Interface Contractor with all information necessary to enable the Interface Contractor to follow-on and proceed with their co-ordination.

4.20.6. Any claim of additional costs by other Interface Contractors as a result of the Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and

updating of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each design stage by the specified dates.

- 4.20.7. The Contractor shall establish a dedicated Interface co-ordination team of managers, engineers, supervisors, technical staff, experts, and support staff, led by an Interface Coordinator reporting to the Contractor's Project Manager. The primary function of the team is to provide a vital link between the Contractor's design and manufacturing teams and the Interface Contractors. The Engineer shall have the right to require the replacement of the Coordinator if in his opinion the Coordinator is unable to meet the coordination requirements of the Contract. The Contractor's attention is drawn to the need for the Coordinator to establish effective dialogues and communication links with the Interface Contractors. The Contractor's coordination team shall comprise a mix of personnel with experience in both design and manufacture of rolling stock necessary for effective coordination.
- 4.20.8. The Coordinator shall assess the progress of co-ordination with the Interface Contractors by establishing lines of communications and promoting regular exchange and updating of information so as to maintain the Contractor's program.
- 4.20.9. The complexity of the Project and the importance of ensuring that the work is executed within time limitations require detailed programming and monitoring of progress so that early program adjustments can be made in order to minimize the effects of potential delays.
- 4.20.10. The Coordinator in conjunction with the Interface Contractors shall identify necessary provisions in the Works for plant, equipment, and facilities of the Interface Contractors. These provisions shall be allowed by the Contractor in his design of the Works.
- 4.20.11. During the course of the Contract, information will be obtained in a number of ways, including direct inspection, regular site meetings, the obtaining of progress reports, and the use of turn around documents to obtain design and program data. Turnaround documents shall be issued to the Interface Contractors to be returned giving the current positions on their program.

4.21. Spare Parts Management Plan

- 4.21.1. The Contractor shall submit for Approval by the Employer a Spare Parts Management Plan. This plan shall include, but not limited, to the following:
- (1) List of O&M Spares
 - (2) Quantities of O&M Spares together with calculation to determine holding and usage.
 - (3) List of proposed Capital Spares and lead for purchase by the Employer.
- 4.21.2. The Contractor shall submit the Spare Parts Management Plan not later than twelve (12) months prior to the issue of the Taking Over Certificate for a System, a Section, or the Works.

5. WORKS TRAIN OPERATIONS

5.1. Requirements during the Construction

- 5.1.1. The Contractor shall implement works train operation which shall be in accordance with the Works Train Manual that has been given a Notice of No Objection by the Engineer.
- 5.1.2. The Contractor shall prepare for Approval and implement a Works Train Manual that will cover the operation of its works trains and the management of access to the site: The manual shall cover, but not be limited to, the following topics:
- (1) General Safety Requirements, including training and qualification, accident prevention, riding on works train, track crossing and clearance, safety inspection, work train notice, personal protective equipment, warning sign and notices, smoking, etc.;
 - (2) Definitions of Defined and Restricted Areas.
 - (3) Communication Rule, including the use of communication equipment, radio communication rules, hand signals, train horn signals, and line side signage;
 - (4) Signal Rules including signal types and meaning, and safety requirements and precautions to be observed while operating works train, etc.;
 - (5) Rule Governing Track Access and possession’s etc.; for all contractors engaged on this project.
 - (6) Management of access for all parties and planning through regular Works Trains Meetings.
 - (7) Work Permits for high risk works such as working at height, confined space, hot work, lifting work, etc.;
 - (8) Work Train Operations Rules for normal, degraded, and emergency operation and include planning of works train activities, execution of works train activities, fault reporting and handling, adverse weather arrangement, incident and accident management and investigation, etc.;
 - (9) Turnout and Switch Operation including qualification of switch operator, turnout and switch operation safety requirements and work process;
 - (10) Traction Power Control Rules, including general operation safety requirement, emergency power cut, authorization to interrupt traction power supply, power isolation for engineering possession, testing electrical power supply to the power rail, use of power rail short circuit device, local operation of traction power switchgear and transfer switch, confirmation of clear area, notification of traction power supply restoration, permission to restore traction power supply, etc; and
 - (11) Track Trolley Operation Rules including types of track trolleys, restriction on the use of track trolleys, personal protective equipment to be worn when using a track trolley, loading and unloading, pre-use check (wheels & brakes), warning lamps, operating a track trolley, moving over points, securing and storing a track trolley when not in use, etc.
- 5.1.3. Whilst working in the tunnel sections additional suitable ventilation shall be provided by

the contractor to ensure air quality standards are met and that an airflow of 0.3 m/s is maintained.

- 5.1.4. The contractor shall provide portable earths and live line testers to ensure construction work undertaken by any party will remain safe when being undertaken in the vicinity of energized tracks.
- 5.1.5. The contractor shall provide all multi-aspect lamps and flags and associated equipment for protecting the work site during possessions
- 5.1.6. A temporary communication system and equipment for the works train operation such as portable radios shall be provided. Additionally, other communication equipment shall be provided to allow communication with all other Works Train operation staff.
- 5.1.7. Prior to the track becoming a Defined Area all-access, egress, and areas close to the track shall be secured with necessary barriers and signage provided and installed by the Contractor.
- 5.1.8. The Contractor shall be responsible for managing all access and permits to the railway until handover to the Employer for commencement of Operations.

6. DESIGN SUBMISSION REQUIREMENTS

6.1. General

- 6.1.1. The objective of the design submission process is to ensure that the proposed resulting works comply with the ERT, are capable of being produced consistently to exacting quality standards, achieve low life cycle costs, and can be operated safely to the satisfaction of the Engineer.
- 6.1.2. The system and all equipment shall be able to withstand the environmental conditions experienced along the entire NSCR alignment. Where figures are not stated the contractor shall submit for approval the conditions to which the design has been based which shall include temperature, relative humidity, solar radiation, wind velocity, lightning, vibration and shock, proximity to coastal areas, flood and earthquake.
- 6.1.3. The design submissions include Design Reports, which shall include design calculations, simulation and calculation, and all other design-related information and Design Drawings.
- 6.1.4. In the event that a statutory body (e.g., Government of Republic of the Philippines - Department of Transport, etc.) requires design information in a particular format, it shall be incumbent upon the Contractor to provide the same, as directed by the Engineer.

6.2. Review of Data

- 6.2.1. As soon as practicable after Contract award, the Contractor shall review all applicable data, criteria, standards, directives, and information provided to him as the basis for design. Any apparent inconsistencies or erroneous information shall be brought to the attention of the Engineer. Such information shall not alleviate the Contractor from his responsibilities under the Contract.

6.3. Format of Deliverables

6.3.1. The format and exchange of all deliverables shall be in accordance with the “BIM Information Management Flow” which shall be issued by the Engineer.

6.3.2. Drawing and CAD Standards. Reports, calculations, specifications, technical data, and similar documents shall be provided in A4 format, and one of the copies shall be ring bound to facilitate photocopying. A3 size drawings included in documents shall be folded to A4 size.

6.3.3. Drawing and CAD Data Format:

Within 30 days after the Commencement Date, the Contractor shall have prepared and submitted the Drawing and CAD procedure together with sample drawings and corresponding CAD data to demonstrate his understanding and compliance with Drawing and CAD Standards.

6.3.4. Building Information Model (BIM) Execution Plan for LOD 100 to 500

Within 30 days after the Commencement Date, the Contractor shall submit their BIM Execution Plan for LOD 100 to 500. The contents of this plan shall cover:

- (1) Equipment to be deployed;
- (2) Project Information;
- (3) BIM design process;
- (4) BIM information exchange;
- (5) BIM and Facility Data Requirement;
- (6) Collaboration and interfacing procedures;
- (7) BIM Model Quality control procedures;
- (8) BIM model structure;
- (9) Technology Infrastructure Needs;
- (10) BIM Project Deliverable;
- (11) Delivery Strategy;
- (12) Virtual Design Reviews and Clash Analysis.

The contractor shall produce all designs in internationally accepted and CAD and 3D formats given a Notice of No Objection by the Engineer. The details are of which are to be provided given a Notice of No Objection by the Engineer. The Contractor shall develop BIM models of all elements as a single system/discipline 3D model; each model shall be spatially coordinated in conjunction with the BIM models of the civil works and interfacing works, provided progressively by the Engineer and Interfacing Contractors, into a three-dimensional federated model using 3D object-based software; allowing for the fully coordinated design drawings to be annotated and extracted as required.

The final “as-built” model shall be LOD 500 (as per CIC BIM Forum LOD definition).

All the Contractors shall propose and submit to the Employer and Engineer the Line Replacement Unit (LRU) level for the BIM to identify the details on interface with

CMMS.

6.4. Number of Copies

6.4.1. The following quantities of drawings and other documents shall be submitted to the Engineer, including preliminary, pre-final, and final design submissions, the final contract document, and all other submissions. These drawings and documents are in addition to those required for the exchange of information between the Interface Contractors and other submissions to statutory, governmental, and local authorities if required.

- (1) 4 full-size sets of paper drawings (folded and collated)
- (2) 4 sets of Design Reports including design documents and calculations, structural analysis, simulation and calculation, and all other design-related information.
- (3) 4 sets of all other submissions.
- (4) 2 sets of each of the above in electronic format

6.5. Design Submission Program

6.5.1. The Contractor shall prepare the Design Submission Program which sets out fully the Contractor's anticipated program for the preparation, submission, and review of the Design Packages, the Final Design Submission, and the Installation and Manufacturing Drawing Submissions and for the Issue of Notices in relation thereto.

6.5.2. The Design Submission Program shall:

- (1) be consistent with and its principal features integrated into the Works Program, and show all relevant major activities;
- (2) identify dates and subjects by which the Engineer's decisions should be made;
- (3) make adequate allowance for periods of time for review by the Engineer;
- (4) indicate the Design Interface and Coordination requirement and periods for each Interface Contractor;
- (5) include lists of requisite design details for each and every component or equipment of all systems.

The Contractor shall update the Design Submission Program suitably if the Engineer observes any deviation.

6.5.3. For the system and components of the Works or the Plant, the Contractor shall submit documents and drawings describing function description, product description, interface requirement description, RAM requirement description, life cycle calculations, type and routine test specifications, list, and details of spares, related calculations, etc. The Design Submission Program shall also include a listing of various plans, processes, and other submissions.

6.6. Design Process

6.6.1. The Contractor shall deploy the staff having sufficient experience in the design of similar works at all times to maintain liaison with the Engineer. The principal requirement of the design phase is to undertake the design during this phase in three stages:

- (1) the preparation of the Preliminary Design;

- (2) the preparation of the Pre-final Design; and
- (3) the preparation of the Final Design.

6.7. Preliminary Design

6.7.1. The purposes of the Preliminary Design submission are as follows:

- (1) State the design criteria;
- (2) Design the overall system, and propose the system configuration;
- (3) Identify the functions of each system, equipment, or other elements within the overall design, and specify the relationships and interfaces between elements of the system;

6.8. Pre-Final Design

6.8.1. In the Pre-final Design stage, the Preliminary designs (including interfaces with those of Interface Contractors of the Employer, and the Contractor's vendors) are required to be fully developed. In this stage, each element of the system will be considered and preliminary specifications with supporting calculations developed. Preliminary electrical and control schematics shall be developed to illustrate how various operational and functional requirements are achieved including structural analysis, simulation, and calculation. Software design and development shall also be carried out at this stage.

6.8.2. Manufacturing can only commence after receiving Approval from the Engineer. This submission shall include sufficient detail from prospective suppliers to demonstrate that they have an adequate understanding of the requirements. It will include either evidence of or proposals for design verification such as analysis and simulation. Interfaces with other Interface Contractors shall be finalized by this stage.

6.9. Final Design

6.9.1. The purpose of the Final Design submission is to agree with the Engineer that the equipment is satisfactory, compliant with the specification, fit for purpose, and safe. The Final Design shall be the level of design developed to the stage where all manufacturing drawings (including those received from Interface Contractors of the Employer, and vendors of the Contractor) are fully defined and specified and in particular:

- (1) Calculations and analyses are complete;
- (2) All main and other significant elements are delineated; and
- (3) All other works, including studies, investigations, and reports are complete.

6.10. Design Submission and Review Procedure

6.10.1. All design submissions from the Contractor shall be accompanied by a Design Review Certificate Application (DRCA) notice. The forms and numbering system of the DRCA notice shall be subject to the issuance of a Notice of No Objection by the Engineer.

6.10.2. Upon receipt of design submissions from the Contractor, a copy of the DRCA will be signed, dated, and returned by the Engineer.

6.10.3. The Engineer shall issue a Design Certificate Consent (DCC) Sheet properly dated and numbered to the Contractor for each of the DRCA. The DCC will carry status as Notices of "Reject", "Notice of No Objection with Comments", "Notice of No Objection" and decisions made by the Engineer in response to the DRCA made by the Contractor. The

DCC sheet properly dated and numbered shall be sent to the Contractor. The consent sheet number shall be the same as the Design Review Certificate Application number except that the letters "DRCA" are replaced by "DCC".

- 6.10.4. When significant comments are noted by the Engineer on the design submission, the DRCA shall be returned "Rejected", and signed by the Engineer. One copy of the DRCA shall be returned to the Contractor together with the comments on why the submission was rejected.
- 6.10.5. When minor comments are noted by the Engineer on the design submission and it is "Notice of No Objection with Comments" the DRCA will have the appropriate decision indicated upon it and be signed by the Engineer. One copy of the DRCA, together with comments, will be returned to the Contractor.
- 6.10.6. A submission will be rejected automatically if not signed by the Contractor's Representative or the Contractor's Authorized Design Representative.
- 6.10.7. Upon receipt of a decision sheet from the Engineer, the DCC will be signed, dated by the Contractor, and returned to the Engineer.
- 6.10.8. To ensure efficient information management on the project the Engineer has determined that a web-based Electronic Document Management System (EDMS), shall be the only recognized method of transmittal for formal project correspondence, documents, drawings, models, data, and information. Where it is necessary to transmit original signed documents, these shall be acceptable forms of correspondence only when they have been issued via the EDMS. The format of all transmitted files shall be in both the native form and the Portable Document Format (PDF).

The Contractor shall use the EDMS selected by the Engineer during the whole project life cycle. The EDMS shall be used by all participants engaged on the Project, including the Contractor, Interface Contractors, Subcontractors, sub-Subcontractors, manufacturers, suppliers, and their subsequent legal successors in title.

All costs associated with licenses and/or tokens required for the EDMS shall be borne by the Contractor.

6.11. Engineer's Review

- 6.11.1. The Engineer will complete his review of the submission within 21 calendar days, after which the review comments will be furnished to the Contractor in writing. The Contractor shall then meet with the Engineer to discuss the review comments. Within two weeks of the receipt of the Engineer's comments, the Contractor shall submit his proposals for implementation in the next submission. Where the comments are minor, such proposals may be clarified by calculations, part prints, etc. acceptable to the Engineer and included in the Contractor's next submission.
- 6.11.2. After the Engineer reviews the design submissions, the Contractor shall update the documentation incorporating the Engineer's observations and also other design requirements. For all subsequent submissions, the Contractor shall demonstrate that all the previous comments by the Engineer have been incorporated. The Comments previously issued by the Engineer shall also become part of the submission.
- 6.11.3. The design submissions for the relevant design of Railway Systems shall require Approval by the Engineer.

- 6.11.4. Any submissions received that do not meet the required quality and content shall immediately be rejected by the Engineer and shall not be subject to review.

6.12. Final Design Document Delivery

- 6.12.1. To achieve agreement with the Engineer on the completion of the design and to allow the formal submission of the Final Design, the Contractor shall submit a list of all accepted design submissions to the Engineer for review along with self-adhesive stickers signed by the Contractor's Representative. If there is Approval by the Engineer, he shall then sign and return the self-adhesive stickers to the Contractor for affixing to the amended Final Design documents including Drawings (original) prior to their submission under the Final Design Document Delivery.
- 6.12.2. Based on the Engineer's review of the Final Design Submission, the Contractor shall then re-submit the entire Final Design Submission together with the following documents:
- (1) joint statements of completed design interface with the Interface Contractors of the Employer, if applicable;
 - (2) a signed statement confirming that he has incorporated all comments of the Engineer;
 - (3) a Design Certificate duly endorsed, in the form accepted by the Engineer.

These above jointly will be known as "Final Design Document Delivery".

6.13. As-Built Drawings and Records

- 6.13.1. The As-Built Drawings are intended to show the Works exactly as constructed. These are prepared by amending the installation and manufacturing drawings to take into account changes necessitated by manufacturing methodology. These drawings shall be completed on a regular basis as the Works progress.

The As-Built Records shall include all record photographs, all test results, and all inspection records and shall be endorsed by the Contractor as true records of the execution of the Works.

The Contractor shall supply to the Engineer, the required numbers and types of copies of the relevant As-Built Drawing/Completion Drawings. The Works shall not be considered to be completed for the purpose of taking over until the Engineer has received these drawings.

- 6.13.2. Two full-size sets of paper copies and one set of electronic files of the As-Built Drawings shall be submitted to the Engineer prior to the commencement of the Tests on Completion.

Prior to the issue of the Handover Certificate and in accordance with the Conditions of Contract, the Contractor shall supply the 7 full-size sets and two sets of the electronic file of the As-Built Drawings and the 5 sets of hard copies and two sets of the electronic file the As-Built Records.

- 6.13.3. During the Defect Notification Period, if the Works would be modified due to the failure of the Contractor, the updated As-Built Drawings and Records shall be re-submitted at the end of the Defect Notification Period.

6.14. Post-Acceptance Changes

- 6.14.1. The changes to accepted drawings, whether they are initiated by the Contractor or the Engineer, shall be submitted through the procedure prescribed in Sub Clause 6.10 above. Upon acceptance of the post-acceptance change, the Engineer shall issue a DCC to this effect. Submission as a result of a post-acceptance change shall use a new DRCA number, i.e., not a previously used one.
- 6.14.2. The Contractor may propose an alternative procedure for implementing post-acceptance changes (hardware and software) for review of the Engineer.
- 6.14.3. For requesting any change to the accepted design, the Contractor shall submit the relevant design details for review of the Engineer. The Contractor shall not implement any change without receiving Approval from the Engineer.

6.15. Approval of Manufacturers and Suppliers

- 6.15.1. Details of all the proposed materials, assembly and component suppliers, manufacturers, and sub-contractors shall be submitted for Engineer’s Approval.
- 6.15.2. The Contractor shall demonstrate in the submissions for supplier/manufacturer approval that all the proposed suppliers/manufacturers have successfully manufactured the same or similar items before for previous projects.
- 6.15.3. Information to be submitted for manufacturers and supplier’s approval shall, as a minimum, be:
 - (1) name of Supplier;
 - (2) previous experience of supplying similar materials, component, assembly, or service;
 - (3) list of similar items supplied, or services rendered;
 - (4) for materials, components, and assemblies the internal testing facilities at the Supplier/manufacturer’s works; and
 - (5) Supplier/manufacturer’s quality procedures, organization, and certification.
- 6.15.4. The Contractor shall obtain Approval for the materials, assemblies, and components and their supplier/manufacturer or sub-contractor prior to confirming any order with a supplier, manufacturer, or sub-contractor. Supplier familiarization and quality inspections shall be undertaken as stated in Clause 4.5.11.

6.16. Material Control Schedule

- 6.16.1. The Contractor shall produce and submit for Approval a Material Control Schedule (MCS). The format of MCS shall be given a Notice of No Objection by the Engineer and shall contain the following minimum information:
 - (1) Materials, assembly or component description;
 - (2) Name, supplier/manufacturer;
 - (3) Country of supply/manufacturer;
 - (4) Drawing number, status, etc;

- (5) Purchase order number/reference;
- (6) Quantity;
- (7) Approval status;
- (8) Planned and actual production start date(s);
- (9) Planned and actual finish date (s);
- (10) Planned and actual date or release for shipment;
- (11) Planned and actual arrival on Site;
- (12) Date and quantity required on-site;
- (13) Mode of transportation;
- (14) Comments/actions; and
- (15) Planned and actual installation requirements.

6.16.2. The MCS shall be updated and maintained as a live document.

6.16.3. Where the MCS shows a delay from the planned dates, the contractor shall provide for Approval details of the measures that will be undertaken to recover any delay experience.

6.17. Method Statements

6.17.1. The Contractor shall submit for the approval Method Statements and an Inspection and Testing Plans addressing all construction/installation procedures, safety, and health requirements, environmental control measure, and quality control procedures for each task not less than fifty-six (56) days prior to the start of the related construction/installation activities.

6.17.2. The Method Statement, material submissions, and Inspection and Testing Plan shall have received Approval prior to the contractor commencing any work on the task described.

6.17.3. Method Statements originating from sub-contractors shall have been reviewed and approved by the contractor prior to the submission.

6.17.4. Before the commencement of work, specific Method Statement training shall be provided to the supervisors and workers involved in the work, on the agreed safe work method and safety precautions to be implemented.

6.17.5. The Contractor shall provide to each of their site representative(s) involved with the works approved Method Statement(s), Inspection and Testing Plan(s), and other related document(s).

7. DOCUMENT AND DRAWING SUBMITTALS AND REVIEW

7.1. General

The Contractor shall transmit all submissions to the Engineer according to the procedure laid down in the following paragraphs. The general requirements are as follows:

The Contractor shall provide a non - web-based system of transmittal for formal project correspondence, documents, drawings, and information and ensure efficient information

management on the Project. The Contractor shall provide the Project-wide use of the system during the Design and Construction Phases and also the Defects Notification Periods.

7.2. Project Document Control Procedure

Within twenty-eight (28) days after Commencement Date, the Contractor shall submit a Project Document Control Procedure to the Engineer for review, which shall include but not be limited to the following:

- (1) a document approval system which shall specify the level of authority for approval of all documents and material before submission to the Engineer,
- (2) a system of issuing documents to ensure that pertinent documents are issued to all appropriate locations,
- (3) a document change or re-issue system to ensure that only the latest revision of a document can be used, and
- (4) a submission identification system that identifies each submission uniquely by the following:

Contract number, Discipline, Submission number; and Revision indicator.

7.3. Document Submissions

- 7.3.1. The Contractor shall submit a Drawing Register to the Engineer in electronic copy and hard copy with each submission of drawings and at an interval agreed by the Engineer. The drawing register shall be in a format submitted for review and given a Notice of No Objection by the Engineer and shall include each document reference number, version, date, title, and data-file name.

7.4. Submission and Response Procedure

7.4.1. General

Where submissions related to the Works are required, except where specific procedures are given for certain items, all submissions shall be submitted and reviewed according to the procedure laid down in the following clauses.

7.4.2. Proposal

Each submission shall be accompanied by a brief introduction to explain which equipment, part, or section of the Contract Works to which the submission refers, listing the documents enclosed with the submission, and describing in outline how all relevant requirements of the Works Requirements are achieved by the proposals.

7.4.3. Submission Response Request

For each submittal, the Contractor shall prepare a Submission Response Request (SRR) carrying the date of submission, the submission reference number, the submission title, and the authorized signature of the Contractor’s responsible engineer to confirm that, in the opinion of the Contractor, the submission:

- (1) complies with all relevant requirements of the Works Requirements,
- (2) conforms to all interface requirements,

- (3) contains, or is based on auditable and proven or verified calculations or design criteria,
- (4) has been properly reviewed by the Contractor, according to the Contractor’s Quality Assurance System, to confirm its completeness, accuracy, adequacy, and validity,
- (5) has taken account of all requirements for approval by statutory bodies or similar organizations, and that where required, such approvals have been granted, and
- (6) contains 2 (two) properly signed copies of the Design Certificate (Form DC),
- (7) Each design submission shall be accompanied by a design statement and compliance matrix which describes the scope and content of each submission, its underlying assumptions, and non-conformances.

7.4.4. Reports and Records

- (1) The Contractor shall submit reports and records to the Engineer in a format and periodicity agreed by the Engineer. Reports and records shall be signed prior to submission by the Contractor’s agent or by a representative authorized by the Contractor.
- (2) The Contractor shall submit the documents as required by the Engineer as Project records in full and on time. The Engineer shall determine the adequacy of the Project record.
- (3) The Contractor shall establish and maintain a place for the storage and archiving of all the documents relating to the Contract Works but not required to be submitted to the Engineer.
- (4) Project records will eventually be used by the Employer to manage, operate, and maintain the Contract Works after the completion of the Project under construction and for future reference.
- (5) The Contractor shall also submit the Interface Register with the status of the Interface progress along with the Monthly Progress report in the format as agreed by the Engineer with a 3 months extract showing those interface activities achieved during the previous month and those projected for the 2 months period ahead with details of any interfaces currently in progress and any that have been missed with mitigation proposals.

8. MANUALS AND DOCUMENTS

8.1. Manuals and Documents for Equipment and Systems

The Contractor shall produce manuals and documents for all the equipment and systems supplied in Railway System works. These shall include, but may not necessarily be limited to, the following:

- (1) System Documents - a comprehensive description of all system principles at block diagram level,
- (2) Operating/User Manuals - broken into as many sub-sections as may be necessary and providing sufficient information to enable non-technical staff to fully exploit the facilities of each system,

- (3) Workshop Documents - installation and circuit descriptions, full schematics, circuits, wiring diagrams, mechanical construction drawings, and itemized parts list to enable all maintenance rectification and setting-up to be carried out,
- (4) Software System Documents - for each software package and each piece of equipment which incorporates programmable devices and for which bespoke software has been prepared specifically for this application, source code listings with comprehensive comments shall be provided for all bespoke software together with configuration listings for all configured standard software packages,
- (5) Equipment Room Documents - all wiring diagrams and circuits, equipment layout, terminal and cable listing, and including such external equipment as may be necessary for completeness.
- (6) Maintenance and Servicing Manuals - to specify requirements, procedures, and service intervals for planned preventative maintenance and in addition to convey sufficient information on equipment principles and practice to enable first line fault diagnosis and rectification by technician staff.

8.2. Operation Manuals

8.2.1. The Contractor shall provide Operation manuals explaining the purpose and operation of the complete system together with its component subsidiary systems and individual item of equipment. The characteristics, ratings, and any necessary operating limits of the equipment shall be provided.

8.2.2. Content Structure

The Contractor shall arrange all documentation in accordance with the following guidelines for all Operation manuals:

- (1) The first section shall be an overview of the functions provided by the systems.
- (2) All functions shall be described, and all operator input clearly defined.
- (3) All system operating sequences shall be explained.
- (4) All indications and alarms shall be described together with the appropriate operator response.
- (5) Descriptions of indications and operator inputs shall be accompanied by pictures or screenshots of the control interface.
- (6) Lengthy technical descriptions of the systems in sections on operator input shall be avoided and if required shall be segregated into an appendix for reference.
- (7) Relevant system block diagrams, drawings, flow charts, etc. shall be provided where these assists understanding of the text and the significance of the equipment alarms and status indications.

8.3. Maintenance Manuals

8.3.1. The Maintenance Manuals shall provide detailed instructions for the Railway Systems. These manuals shall be produced with due regard to the qualification of personnel who shall be required to refer to them. These documents will be issued as controlled documents and should therefore be collated and numbered in proper order corresponding to the contents and index pages. Nomenclature of equipment, diagrams, and figure numbers or units shall be consistent throughout the text. In order to comprehend the text, diagrams,

drawings, sketches, and actual photographs shall be added where necessary. All manufacturers’ literature identification codes or stamp markings shall be omitted. Precautions and warnings regarding the safety of life and equipment shall be included where applicable. Manuals shall be clearly identified as being:

- (1) Preventive maintenance,
- (2) Recovery/corrective maintenance, and
- (3) Software maintenance.

8.3.2. The Contractor shall arrange all documentation in accordance with the following guidelines for all Maintenance manuals:

- (1) The first section shall be an overview of the functions provided by the systems.
- (2) All functions shall be described, and all operator input clearly defined.
- (3) All system operating sequences shall be explained.
- (4) All indications and alarms shall be described together with the appropriate operator response.
- (5) Descriptions of indications and operator inputs shall be accompanied by pictures or screenshots of the control interface.
- (6) Lengthy technical descriptions of the systems in sections on operator input shall be avoided and if required shall be segregated into an appendix for reference.
- (7) Relevant system block diagrams, drawings, flow charts, etc. shall be provided where these assists understanding of the text and the significance of the equipment alarms and status indications.

8.4. Electronic Manuals

- 8.4.1. The Contractor shall provide manuals in the electronic format. This is in addition to the submission of manuals in hard copies.
- 8.4.2. The format of the electronic copies shall be proven in at least two other applications and shall allow for links between parts catalogue and maintenance instructions.
- 8.4.3. The Document Management System and language used shall be subject to the Engineer’s review.

8.5. Operating/User Manuals and Maintenance and Servicing Manuals

Operating/User Manuals and Maintenance and Servicing Manuals shall be divided into indexed sections explaining the subject matter in logical steps. Most manuals shall consist of A4-size printed sheets bound in stiff-cover wear-resistant binders clearly and uniformly marked with the subject matter and reference number. Where alternative sizes are proposed, (e.g. A5/A6 pocketbooks of schematic wiring diagrams) these shall be for review and acceptance. The binding shall allow for all subsequent changes and additions to be readily affected.

Information shall be provided in pictorial form wherever and whenever possible and shall include step-by-step instructions and views of the particular equipment including exploded views.

The Contractor shall provide clarifications and amendments to the manuals as necessary

during the execution of the Contract. Updates shall be provided for the originals and all copies.

8.6. Submission of Manuals and Documents

The Contractor shall submit at least (a) System Documents, (d) Software System Documents, and (e) Equipment Room Documents in Sub-Clause 8.1 for review by the Engineer prior to Factory Acceptance Tests. All the other documents shall be submitted by the Contractor before the installation construction starts.

The Operating/User Manuals, the Maintenance and Servicing Manuals, and other technical manuals and documents shall be prepared in English and Tagalog.

All the manuals and documents shall be reviewed and given a Notice of No Objection by the Engineer.

8.7. Number of Submission Copies

The Contractor shall provide six (6) copies of all manuals and documents (and one CD) for the use of the Engineer and the Employer.

9. MANPOWER AND WORKFORCE

9.1. Local and Overseas Filipino Worker (OFW)

For onshore works in the Philippines, the Contractor is encouraged and highly recommended to accommodate and give priority to local and Overseas Filipino Workers (OFW) displaced by COVID-19, and workers availing the Balik Probinsya Bagong Pag-asa program should not be less than 10% of their workforce, unless no such workers are available for the project as certified by the Department of Labor and Employment (DOLE) Regional / Provincial / Field Offices.

9.2. Engagement of Staff and Labor

The Contractor shall take pro-active measures to encourage the employment of women and PWDs with the aim to achieve at least 20% women and 5% PWDs in skilled and unskilled positions in all stages of construction.

10. INSPECTION, TESTING, AND COMMISSIONING

10.1. General

10.1.1. Inspection, Testing, and Commissioning shall comply with all requirements of the GC supplemented, amplified, modified, or superseded as applicable by the PC, the ERT, and the ERG.

The Contractor shall perform all inspection, testing, and commissioning activities to satisfactorily demonstrate that when completed, the Works would be fit for the purposes for which the Works are intended as defined in the Contract.

The Contractor shall provide all necessary equipment and test instruments, special tools, emulators, simulators, and test software, to carry out the test at his cost. The use of this test equipment, tools, and others shall be subject to approval by the Engineer.

The Contractor shall carry out the FAT at the premise of designated manufactures.

The Contractor shall be responsible for providing temporary electricity supply, all instruments, gauges, test equipment, tools, accessories, personnel, services, and necessary facilities required for the execution of all tests and inspection. Wherever necessary, the Contractor shall provide two or more sets of testing equipment, tools, and others to expedite testing. All test equipment shall be accompanied with the appropriate calibration certificate by a testing authority of the equipment.

The Contractor shall submit the Inspection, Testing, and Commissioning Management Plan for the Engineer’s review as per the schedule furnished in Table 4-1 of Appendix 4 attached hereto. The purpose of the Inspection, Testing, and Commissioning Management Plan is:

- (1) To provide evidence as to how the Contractor will plan and program his tests and inspection and test activities; and
- (2) To allow the Contractor to indicate his “Witness and Quality Hold Points” for selected operations.

10.1.2. The Inspection, Testing, and Commissioning Management Plan shall be prepared in accordance with the Employer’s Requirement – ERT. This plan shall also include integrated testing and commissioning of trains in the section and service trials before introduction in revenue service. The plan shall contain, but not limited to, the following topics:

- (1) the Contractor’s methodology for inspection, testing, and commissioning;
- (2) all Inspections and Quality Hold Points;
- (3) inspection, testing, and acceptance operations performed on the parts during and after fabrication;
- (4) inspection, testing, and acceptance operations performed on sub-assemblies composed of these parts if any;
- (5) inspection or test operations performed during on-site activities;
- (6) tests, inspections, and examinations performed on systems assembled in shop and site;
- (7) the interdependency and inter-relationship with Interface Contractors and their commissioning program;
- (8) the objectives of each test and criteria for successful tests;
- (9) organization chart and Curriculum Vitae of key personnel in the testing and commissioning team; and
- (10) documentation for conducting tests and submission of testing and commissioning procedures.

- 10.1.3. The Contractor shall submit a testing and commissioning programme. This programme shall contain full details of the contents and sequences for all tests to be carried out, together the procedures, standards or limits to be achieved for each test including verification and validation. As part of the commissioning programme, a commissioning strategy report shall be agreed by the commissioning panel or other arrangements to be advised by the Engineer, and shall also be submitted by the Contractor for confirmation of acceptance of the alternative arrangements. In addition, the testing and commissioning programme shall be updated and submitted periodically to the Engineer for control and monitoring of the Contractor’s progress.
- 10.1.4. Inspection Hold Points
- (1) The Contractor shall propose a set of inspection hold points in the Inspection, Testing, and Commissioning Management Plan. The hold points shall be structured so that a formal hold point is allowed for each significant element of the Railway System item’s manufacturing process. At each hold point, the Engineer shall hold a formal inspection, or advice that the inspection has been waived.
 - (2) The manufacturer of each Railway System equipment or part thereof shall not proceed until the inspection by the Engineer has been completed or while waived.
 - (3) No equipment shall be considered ready for delivery without the Engineer’s endorsement in writing. The Contractor shall bear the cost of attendance of the inspections including travel, flight charge from Manila to the place where the inspection will be made, lodging, local transportation, safety equipment, etc., for the Employer’s and Engineer’s Personnel. If the inspection is not be completed satisfactorily, the additional inspection attended by the Employer’s and Engineer’s Personnel will be arranged and the cost of attendance for such additional inspection shall be borne by the Contractor.
 - (4) Once the Inspection and any required remedial actions are completed to the satisfaction of the Engineer, he shall give consent for Railway System equipment’ shipment and/or dispatch.
- 10.1.5. The Contractor or his subcontractor is responsible for the execution and recording of all inspections and tests which are to be found on the Inspection, Testing, and Commissioning Management Plan. All the technical conditions of the material manufacturing and testing have to be included in the material and part acceptance certificates.
- 10.1.6. For manufacturing and on-site activity surveillance, the Contractor will develop and implement a test and commissioning plan, which includes acceptance tests.
- 10.1.7. The Engineer will then check the plans to see whether it meets the requirements or not. The Engineer shall inform the Contractor in writing within a reasonable period after receipt of the following information;
- (1) that the Contractor's proposed methods of inspection, testing, and commissioning (including Integrated Testing and Commissioning) have the consent of the Engineer;
 - (2) in what respects, in the opinion of the Engineer about the Contractor's proposed methods, etc.;
 - (3) fail to comply with the Employer's Requirements and/or the Final Design Document;
 - (4) would be detrimental to the Works and/or to the other works comprising the Project;

- (5) do not comply with the other requirements of the Contract; or
- (6) as to the further documents or information which is required to enable the Engineer to properly assess the proposed methods of inspections etc.

10.1.8. In the event that the Engineer does not give his consent, the Contractor shall take such steps or make such changes in the said methods or supply such further documents or information as may be necessary to meet the Engineer's requirements and to obtain his consent. The Contractor shall not change the methods of inspection, testing, and commissioning (including Integrated Testing and Commissioning) which have received the Engineer's consent without further review and consent in writing of the Engineer.

10.1.9. Notwithstanding the foregoing provisions of this Chapter, or that certain of the Contractor's proposed methods of inspection, etc. may be the subject of the consent of the Engineer, the Contractor shall not be relieved of any liability or obligation under the Contract.

10.1.10. The Engineer shall have the facility to monitor all tests and have access to all test records. Ample time shall be allowed within the testing program for necessary alterations to equipment, systems, and designs to be undertaken, together with re-testing prior to final commissioning.

10.1.11. Unless agreed in writing by the Engineer, personnel engaged in testing shall be independent of those directly engaged in the design or installation of that equipment however, subject to the approval of the Engineer the system designer could be engaged in the design qualification tests such as type tests and first article inspections.

10.1.12. All test equipment shall carry an appropriate and valid calibration label and / or certificate.

10.1.13. For each of the identified tests, the Contractor shall produce a test report, in three copies, and an approved format, within an agreed period following the test, for acceptance by the Engineer. The Contractor shall sign all reports of tests. The Engineer reserves the right to reasonably call for additional tests if considered necessary.

10.2. Non-Conformity and Deviation Disposition

10.2.1. The Non-Conformity and Deviation detected/observed during manufacturing, testing and commissioning shall be grouped into essentially three types and shall be dealt with as under:

- (1) Type 1: Non-conformity not in violation of the ERT or design documents originated by the Contract and given a Notice of No Objection by the Engineer.
- (2) Type 2: Non-conformity with the ERT or design or documents issued by the Contractor and given a Notice of No Objection by the Engineer, but which can be reconciled with the applicable specification.
- (3) Type 3: Non-conformity with the ERT or design or documents issued by Subcontractors and given a Notice of No Objection by the Engineer which cannot be reconciled with the applicable specification. Some examples of this group of non-conformity but not limited to are:
 - Equipment, component, or system unable to meet functional or performance requirements;
 - Critical dimensions (involved in the stress analysis report of interface dimensions) out of tolerance;

- Inspection or control not carded out and is impossible to be repeated;
- Component without appropriate identification to ensure its recording.

10.2.2. These types of non-conformity shall be recorded in a Non-conformity Report (NCR) and reported by the Contractor to the Engineer for processing and disposition. The Contractor shall propose the final solution and submit to the Engineer for his Approval during a meeting before implementation.

10.3. Engineer's Stop Work Order (SWO)

10.3.1. The Engineer or his representative will have the general responsibility to verify that during manufacturing and construction the associated control or test operations performed by the Contractor is in accordance with the relevant submissions that have been given a Notice of No Objection and the requirements of the contract.

10.3.2. A stop-work order is issued when significant situations adverse to quality or safety are noted and immediate action is required.

10.3.3. The stop-work order shall be issued under the following conditions:

- (1) Equipment procured by the Contractor is not able to meet the specified quality level,
- (2) Use of non-approved drawings or documents during the manufacturing of items or equipment by the Contractor (or his Subcontractor),
- (3) Repetitive non-conformity without appropriate corrective action by the Contractor (or his Subcontractor),
- (4) The Contractor (or his Subcontractor) frequently ignores the Engineer's observations regarding inspections, or
- (5) When a significant non-compliance of the Quality Assurance Management Plan or Safety Plan is detected.

10.4. Engineer's Corrective Action Request (CAR)

10.4.1. During the course of performing audit or inspection, the Engineer may identify situations that are contrary to product quality or may lead to products of indeterminate quality, and in such a situation the Engineer shall issue a Corrective Action Request (CAR).

10.4.2. On receipt of CAR, the Contractor shall take Corrective Action and shall return the CAR to the Engineer. In this regard, the Engineer's decision shall be final.

10.5. Test Groups

10.5.1. The Contractor shall structure his testing plan based upon the following testing stages:

(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 the design conforms to all relevant technical requirements, is fit or purpose in the environmental conditions specified, as well as satisfying any additional features that may result from the needs of the RAMS process.

(2) First Article Inspection

The Inspection, Testing, and Commissioning Management Plan shall list all major sub-systems and shall identify those which the Contractor proposes to be subject to First Article Inspection (FAIs). The Engineer will advise any adjustments required and the Contractor shall prepare a visit schedule for inspection of those items as required by the Engineer.

(3) Routine Tests

Routine Tests shall be carried out on items of equipment or sub-systems to be installed in substantial numbers across the railway, or that have a bearing on the overall performance of the railway system.

(4) Factory Acceptance Tests

Factor Acceptance Tests (FATs) shall be conducted at the place of manufacture of the system and comprehensively represent the system in terms of architecture and load, to demonstrate the performance of the system and the approved final design.

(5) Post Installation Check

Post installation and prior to powering up equipment, a check shall be carried out on the installation, wiring and readiness of the sub-system to be powered.

(6) Partial Acceptance Tests

Partial Acceptance Tests (PATs) shall comprise a local test conducted on sub-system/geographic commissioning lot.

(7) Site Acceptance Tests

Site Acceptance Tests (SATs) shall comprise testing of the complete system excluding interfacing systems, i.e., with interfacing systems simulated to demonstrate end to end performance.

(8) System Integration Tests

System Integration Tests shall test the system across the whole railway system fully integrated with any interfacing systems.

(9) Performance Demonstration Tests

This phase of testing shall demonstrate the overall performance of the delivered system as a part of the railway.

11. DEFECTS LIABILITY

11.1. Remedying Defects

11.1.1. The Defect Notification Period of the Railway Systems shall be seven hundred and thirty (730) days from the date of Handover of the Railway Systems subject to any extension under the Conditions of Contract and Sub-Clause 11.1.3 below.

11.1.2. The Contractor shall be responsible for any defect or failure attributable to defective design, material or workmanship, outcome, or notified by (or on behalf of) the Employer during the Defect Notification Period. The Contractor will not be liable for damage caused because the Engineer or the Employer or any other third parties did not follow the written operation and maintenance instructions or did not use the trains in accordance

with the technical documents.

- 11.1.3. During the Defect Notification Period, if any defect, imperfection, or other faults will require any design modification to a component of equipment, the Defect Notification Period of that part shall re-start from the date when such modification of the or component of equipment is completed to the satisfaction to the Engineer and commissioned into service.

- 11.1.4. During the in-service Defects Notification Period (DNP), the Contractor shall demonstrate successful achievement of the RAM performance targets, which will be a prerequisite of the application for a Performance Certificate to be issued by the Employer.

Failure to meet the E&M Systems and Track works RAM targets within the DNP shall mean that the DNP shall be extended until such time as the RAM targets has been met.

Regardless of the above, the maximum DNP is 4 years from the date of issue of the Taking Over Certificate.

11.2. Defect Notification Period

- 11.2.1. During the Defect Notification Period, the Contractor will undertake the necessary remedial works for defect or damage due to the Contractor’s failure at his own risk and expense including spare parts and consumables, if required, and labor.
- 11.2.2. All the equipment and material necessary for testing and remedying defect or damage in connection with the Defect Notification Period will be provided by the Contractor bearing all the related expenses.
- 11.2.3. Notwithstanding that the Contractor has provided the O&M Spares in accordance with the list agreed with the Engineer, the Contractor shall be fully responsible, entirely at his own cost, for the failure of all items during the Defects Notification Period that is not in the list of O&M Spares and shall replace them as soon as reasonably possible. In the event that any item fails before the time that the Contractor has indicated in the Spare Parts Management Plan that it will need to be replaced, such failure shall be deemed to be and shall be treated as a defect.
- 11.2.4. The Contractor shall propose the plan for how he will perform his obligation for the Defect Notification Period including the set-up of the service organization, during the Defect Notification Period. The plan shall include the service organization including both in the Republic of the Philippines and abroad, communication line with the Employer and/or the Engineer, stock of spare parts for Defect Notification Period, etc. During the Defect Notification Period, the Contractor shall be responsible, free of charge, for the repair of defects/damage and replacement of components where the system does not conform to functional specification and performance requirements specified in the Employer’s Requirements. Normal wears and tears are excluded from these defects.
- 11.2.5. The repair and/ or replacement of failed components and equipment and installation of repaired/replaced components/equipment shall be undertaken by the Contractor free of charge at site. The Contractor shall bear the customs duty, freight charges, and all other expenses involved in the collection of defective components and equipment from the Site, and transportation to the manufacturer’s works in the Republic of the Philippines or abroad and its return to the Site after repairs.

- 11.2.6. All replacement and repairs under the Defect Notification Period shall be carried out by the Contractor promptly and completed to satisfaction of the Engineer, on notification of the defect by the Employer and/or the Engineer on behalf of the Employer so that no Railway System equipment is unfit for service for more than twenty-four (24) hours or another period the Engineer may agree to, which shall exclude the time taken for withdrawal/ induction of trains from/to services. The Employer or the Engineer on behalf of the Employer will notify the Contractor in writing of any defect together with a brief description thereof. Upon receipt of such notice, the Contractor shall within a reasonable period of time and at his own costs remedy this defect. If within a reasonable time, the Contractor fails to fulfill his obligations after a reasonable amount of trials for remedying the defect (at least three trials), the Engineer may fix by written notice a reasonable final time for completion of the Contractor's obligations. In case the Contractor fails to fulfill his obligations within such final time, the Employer may himself undertake the necessary remedial works or employ a third party to do so, always at the risk and expense of the Contractor.

12. SOFTWARE MANAGEMENT AND CONTROL

12.1. Prescriptive Framework

- 12.1.1. All software to be developed or modified shall follow the normative requirements of standards proposed by the Contractor. The Contractor shall define within the Software Quality Assurance Management Plan what techniques and measures are to be applied for software development.
- 12.1.2. The Plan shall require the Contractor to provide all changes, bug fixes, updates, modifications, amendments, and new versions of the programs, as required by the Engineer. The Engineer may also direct to provide a copy of the previous version of software till such time the new version of software is proven.
- 12.1.3. The Contractor shall provide all tools, laptop computers, or any special device to upload/download the software, equipment, manuals, and training necessary for the Engineer to maintain all software provided under this Contract. The documentation of software may be supplied after the expiry of the Defect Notification Period under the terms and conditions to be mutually agreed at the time of the contract negotiation.
- 12.1.4. When a fault is discovered in delivered software or an error in the associated documentation, the Contractor shall take the necessary steps to rectify such faults and errors at the earliest opportunity. The Contractor shall supply to the Engineer, full details, in writing, as to the nature of the corrective action proposed or taken. These changes shall be documented in the form of a Software Engineering Change Proposal (SECP), which shall be given a Notice of No Objection from the Engineer. The documentation of software may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed at the time of the contract negotiation.
- 12.1.5. It will be incumbent upon the Contractor to take responsibility for any changes required to the software.
- 12.1.6. It shall provide a cybersecurity framework for the identification and protection of Critical Cyber Assets to support reliable operation of the system, and to protect these assets from cyber-attacks.

12.2. Software Framework

- 12.2.1. All the software produced or supplied for the Project shall be subject to a defined quality framework. The Contractor shall use a Quality Assurance System which is compliant with ISO 9000 series and others and meet the requirements as stipulated in the ERT. ISO 9000-3 is considered appropriate for low criticality software (safety integrity level 0 or 1). The quality framework requirements for safety integrity level 2 and above are supplementary to the requirements of IEC62279 or EN 50128.

12.3. Software Management Control

- 12.3.1. The Contractor shall assign the Software Manager and/ or Software Quality Manager, where software development or modifications are required, under the Contract.

12.4. Auditing

- 12.4.1. The Engineer may carry out an audit of the software. Further external independent audits may also be arranged at the Engineer discretion. The Contractor shall allow the ISA to view the software documentation as deemed required without any hindrance.
- 12.4.2. The Contractor shall conduct audits through an assigned internal software auditor to ensure the process is compliant with ISO 9001, ISO 12207, and EN 50128 or equivalent standards.

12.5. Software Acceptance

- 12.5.1. The Contractor shall also submit an Operational Safety Report (Software) (OSR(S)) for software acceptance by the Engineer.
- 12.5.2. The Operational Safety Report (Software) shall include, as a minimum
- (1) OSR(S) – Introduction.
Shall describe the nature of software sufficiently to ensure that the Engineer is given a comprehensive overview of primary characteristics such as structure, functions, criticality, volume, and language.
 - (2) OSR(S) - Evidence of Quality Management.
Shall provide evidence to demonstrate that the software development has been subject to acceptable quality assurance.
 - (3) OSR(S) - Evidence of Safety Management.
Shall provide evidence to demonstrate that the software development has been subject to acceptable safety management.
 - (4) OSR(S) - Technical Report.
Shall describe how software integrity has been achieved.
 - (5) OSR(S) - Operation and Maintenance Report.
Shall describe the software operation and maintenance characteristics.
 - (6) OSR(S) - Restrictions for Use.
Shall define what restrictions are applied to the use of the software.

- 12.5.3. The sub-systems and associated software-based systems should be accepted as a whole system. Both the embedded and application software shall have different version references for acceptance.

12.6. Availability of Source Code and Development Tools

- 12.6.1. With the exception of Commercial off-the-shelf (COTS) software, the Engineer shall be provided with access to the software documentation including source code listings and development tool details; unless it is tagged as an intellectual property. This would help the Employer for the application and maintenance of that COTS software and can make minor changes when the railway configuration changes. The documentation of software may be supplied after the expiry of the warranty period, under the terms and conditions to be mutually agreed upon during the contract negotiations. Balance source code with all relevant documentation shall be kept by the contractor in an Escrow account. The initial three years lease of the Escrow account shall be paid by the contractor.
- 12.6.2. Complete documentation of non-intellectual property software to be supplied by the Contractor, as above, which enables the Employer to debug and implement the parameter of the system, if considered necessary. The Employer’s engineers shall be fully trained and made conversant with the software and other related issues as found necessary during the Contract execution to enable the Employer to operate, maintain, repairing the system efficiently.
- 12.6.3. After loading and the satisfactory functioning of the software, the Contractor shall supply two back-up copies of the software, including any new versions adopted along with their installation procedure. The documentation of software along with training material may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed during the contract negotiations.

12.7. Re-Use of Existing Software

- 12.7.1. Where existing software (defined to module-level) is to be re-used without modification, the Contractor shall provide acceptable evidence to the Engineer as to why that software is suitable for use in the proposed application. This evidence may be historical (certified evidence of previous satisfactory use in a similar environment and application), or it may be sought as cross acceptance from another railway authority or statutory body. Software re-use shall not be acceptable, without a detailed review, where the proposed application is of the same or lower safety integrity level (SIL) than the current application.

12.8. Test Software

- 12.8.1. All test software, with the exclusion of built-in test software, shall be produced in accordance with a quality system controlled under the requirements of accepted international standards. Test software shall be developed and documented using structured techniques and shall be designed to be maintainable throughout the duration of the Contract. All test software shall be documented to be supportive of maintenance. Any test software, which is to be delivered to the Engineer (for long-term testing use), shall be fully documented including source code listings to allow the Engineer to maintain the software for the life of the supported system.

12.9. Software Rights

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. The documentation of software may be supplied after the Defect Notification Period, under the terms and conditions to be mutually agreed during the contract negotiations. The Contractor shall indemnify the Employer/the Engineer, its heir, or licensees against the claim of any party, subcontractor for the unauthorized possession, or use of the software supplied.

~~12.9.1.~~12.9.2. The Contractor shall provide and hand-over any software or codes developed specifically for, and during this project.

13. SUPPLY OF SPARE PARTS, SPECIAL TOOLS, AND TEST EQUIPMENT

13.1. Details of supply

13.1.1. The Contractor shall provide spare parts, tools and test equipment for the maintenance of all Systems included in the Contract, in accordance with the provisions of this Section, as part of the Works:

- (1) Spare parts including (but not limited to) sub-assemblies and those to be supplied by its sub-contractors of any tier ("Spare Parts");
- (2) Special tools, jigs, fixtures and gauges and test, and maintenance equipment, including those to be supplied by its subcontractors of any tier ("Special Tools and Test Equipment"),

13.1.2. The recommended list of O&M spares and Capital spares shall be updated for the review by the Employer at the time of completion of the Technical Design and again at the time of Construction/Installation Design with the identity of parts by source, OEM part number, and individual price. A final update with the same details shall be made one year before the completion of the works. O&M Spare parts shall be delivered to the Employer no later than six (6) months before the completion of Works.

13.1.3. The information supplied in respect of each spare parts, special tool, and test equipment shall include, but shall not be limited to, the following:

- (1) Core data - main assembly/equipment
 - 1) manufacturer/brand name
 - 2) manufacturer's type/model number
 - 3) rating
 - 4) serial number if applicable
 - 5) total number of the main assembly/equipment supplied under the contract
- (2) Core data - sub-assembly of main assembly/equipment
 - 1) manufacturer/brand name
 - 2) manufacturer's type/model number
 - 3) rating
 - 4) serial number, if applicable
 - 5) total number of sub-assemblies in the main assembly/equipment supplied under the Contract

- (3) Individual item of main/sub assembly/equipment
 - 1) manufacturer order number
 - 2) parts description - a full description of the Spare Part, including a note as to whether it is a sealed unit or whether it is an assembly or sub-assembly which can be broken down into component/parts
 - 3) manufacturer/brand name
 - 4) the manufacturer's part number (if different from the ordering number)
 - 5) the subcontractor's ordering part number/reference, if applicable
 - 6) recommended quantity
 - 7) unit of measurement
 - 8) unit price CIF to Manila including delivery to designated location
 - 9) total number of the Spare Parts in the sub-assembly of the main assembly/equipment supplied under the Contract
 - 10) total number of the Spare Parts in all the sub-assemblies of all the main assemblies/ different equipment supplied under the Contract
The Contractor shall ensure that the ordering part numbers specified shall enable the Employer to procure the exact item in the future without reference to the Contractor.
- (4) Primary data
 - 1) parts catalogue number/cross-reference (illustrated parts catalogues to be submitted together with the spares schedules to the Employer.
 - 2) drawing number
- (5) Secondary data
 - 1) lead times stating whether forex-stock or for product manufactured upon receipt of order.
 - 2) delivery schedule(s).
 - 3) supplementary information:
 - special handling instruction, e.g., for fragile materials, hazardous substances, radioactive materials, etc.
 - storage requirements, e.g., overall dimensions including special packing (if any) for bulky materials, materials with limited shelf life, climate-controlled conditions, etc.
 - statutory requirements, e.g., licenses, test certificates, etc.
 - interchangeability information
 - tailor-made product for the Contract or a standard bought-in product
 - the source of the Spare Part or Special Tool and Test Equipment, including the manufacturer’s name and address together with that of his agent in the Philippines and local sources
 - supplementary sheets to be used for detailed information that is important to the Employer's future procurement.

13.2. Manufacture and delivery of Spare Parts

- 13.2.1. The Spare Parts to be delivered by the Contractor shall be manufactured at the same time as the Permanent Works are being constructed/installed. They shall be manufactured, works tested, and inspected in accordance with the relevant quality system, suitably packed and labeled, and delivered to the Employer by the Contractor. Before any spares are delivered to the Employer, the Contractor shall submit to the Employer’s a shipment

advice notifying details such as date of dispatch, date of arrival, vessel name, etc. as well as a packing list to indicate the contract number, variation order number, the lot size, quantity, and weight.

- 13.2.2. All spares shall be fully interchangeable with their corresponding part and configured to the latest revision during the Defects Liability Period. For spares such as electronic components, lamps, fuses, and high-use items, the Contractor shall ensure that a minimum of two alternative sources of supply are available.
- 13.2.3. If any item is due to become unavailable after the end of the Defects Notification Period, or where support of an item before the end of the design life of the Works will become unavailable, or if the Contractor subsequently ceases trading, the Contractor undertakes to transfer the relevant intellectual property rights, design rights, and technology to the Employer, following which the Employer shall have full rights to the manufacturing drawings, schedules, software and any other information needed to manufacture the relevant item. Such rights shall give the Employer complete freedom to manufacture the items in the Philippines or anywhere else in the world. The Contractor shall also undertake to notify the Employer two years in advance of the intended cessation of spares availability of any item.
- 13.2.4. If any Spare Part is rendered obsolete by a design change or material change during the design life of the Works supplied under the Contract, the Contractor shall design a replacement item to match the identical mechanical and electrical interfaces as the former item.
- 13.2.5. If, as a result of changes in technology, any Spare Part is not completely interchangeable with the original item, or the performance of any Spare Part is different from the original item, then the Contractor shall purchase the same from the Employer, at a price agreed between the parties, such quantities of the obsolete Spare Part as the Employer may possess.

13.3. Testing and Commissioning Spares

- 13.3.1. In addition to the O&M Spares, the Contractor shall keep on the Site throughout the installation, erection, and commissioning periods, sufficient stocks of Spare Parts to enable immediate replacement of any item in the Permanent Works found to be defective or in any way in non-conformance with the Specification during the installation, erection and commissioning period ("Testing and Commissioning Spares").
- 13.3.2. The Contractor shall supply and deliver the Testing and Commissioning Spares on or before the commencement of any Partial Acceptance Tests (PAT) or as defined in the ERT.
- 13.3.3. The Contractor shall submit to the Employer's for review a list of all Testing and Commissioning Spares that shall be made available during the installation, erection, and commissioning period.
- 13.3.4. The Contractor shall not be entitled to use any of the O&M Spares and/or Capital Spares (if any) to replace any item in the Permanent Works during the installation, erection, and commissioning periods.

13.4. O&M Spares

- 13.4.1. The quantities of recommended Spare Parts to be supplied by the Contractor to the

Employer shall be included in the Spare Parts Management Plan.

- 13.4.2. Notwithstanding the quantities defined in the Spare Parts Management Plan, the quantities of O&M Spares shall be sufficient for the full operation of the Works for a period of four (4) years after the Employer's Taking Over of the Works ("O&M Spares").
- 13.4.3. At the end of the Defects Notification Period, the stock of O&M spares shall be replenished and handed to the Employer to cover a further period of two (2) years of operation and maintenance.
- 13.4.4. The Contractor shall supply and deliver the O&M Spares no later than six (6) months before the completion of a System, a Section, or the Works.
- 13.4.5. The Contractor shall submit the spares schedules for the O&M Spares in hard copies (including the illustrated parts catalogues) as well as soft copies to the Employer for review.
- 13.4.6. All spares quantities shall be rounded up to the nearest deliverable unit e.g., cable shall be delivered in complete drums, liquids in complete sealed containers, small parts in complete packs.

13.5. Special Tools and Test Equipment

- 13.5.1. The Contractor shall supply tools, special tools, and test equipment for maintenance needs for all equipment and systems provided under the Contract. Tools, special tools and test equipment shall be provided for scheduled and unscheduled maintenance, including inspections, servicing, preventive maintenance, corrective maintenance, overhaul, and testing.
- 13.5.2. The Tools, Special Tools and Test Equipment (together with the relevant calibration certificates) required to carry out all the functions described in the Operation and Maintenance Manual or as required by the Technical Requirement (ERT) shall be suitably packed and labeled, consigned to the Employer by the Contractor and delivered to the Employer in accordance with the Employer's instructions not later than the date scheduled for stage commissioning. The extent of supply shall include protective carrying cases as may be appropriate for the storage and use of each item.
- 13.5.3. All Special Tools and Test Equipment shall be supplied with Operation and Maintenance Manuals, complete diagrams, schematics, assembly and connection drawings, calibration instructions, and circuit diagrams/descriptions for future maintenance.
- 13.5.4. Where the Contractor has used the Special Tools and Test Equipment for installation and commissioning of the Permanent Works, he shall refurbish and re-calibrate each item to the satisfaction of the Employer prior to handover to the Employer, accompanied by the Certificate of Calibration traceable to a recognized Japanese or Philippine National Standard or other appropriate Standard previously reviewed and given a Notice of No Objection by the Engineer.
- 13.5.5. Where any item of Special Tools and Test Equipment is provided by the Contractor, it shall be accompanied by drawings, manuals, and full operating instructions to enable them to be used by suitably skilled (but not necessarily specially trained) personnel in a non-hazardous manner and to achieve the desired result in terms of accuracy and quality.
- 13.5.6. The Contractor shall provide the means and instructions which describe the parameters

of each item of Special Tools and Test Equipment that are critical to their proper methods of use and which enable the Employer's staff using the Special Tools and Test Equipment to achieve the proper performance and operation. Such means and instructions shall include, but not be limited to, any routine checking, or recalibration needs for the Special Tool and Test Equipment itself.

13.6. Coding and Tagging of all Equipment, Spare Parts and Special Tools and Test Equipment

- 13.6.1. All Equipment, Spare Parts, Special Tools, and Test Equipment to be delivered to the Employer shall each carry a tag suitably marked, bar-coded (as directed by the Engineer), and numbered to sustain harsh environments.
- 13.6.2. Each individual item of equipment shall be fitted with permanent identifications label in accordance the with the coding and numbering convention and requirement developed by the CMMS for all E&M components, parts, and equipment.
- 13.6.3. In this respect the term “individual item of equipment” shall refer to a complete assembly of components and to each removable submodule within the complete assembly.
- 13.6.4. The identification label shall be permanently attached in such a way that it shall not become detached or illegible during the lifetime of the system from any cause including wear and tear, environmental effects (such as rain, direct sunlight, etc.) or any other influence. Preference shall be given to embossed or engraved metallic labels mechanically fastened by riveting or similar means to the item to which they refer.
- 13.6.5. All labels shall be easily cleaned to remove dirt and debris (including grease and oil) without disturbing the legibility properties.

14. PACKAGING, SHIPPING, AND DELIVERY

14.1. General

- 14.1.1. The Contractor shall be fully responsible for the provision and maintenance of acceptable storage facilities for the Plant and any materials or equipment he intends to use for carrying out of the Works or for incorporating into the Works.
- 14.1.2. The Contractor shall prepare, protect and store, in a manner to be accepted by the Engineer, all equipment and materials so as to safeguard them against loss or damage from repeated handling, from climatic influences, and all other hazards arising during transport, shipment, or storage on or off the site. Secured and covered storage shall be provided for all equipment and materials other than those accepted by the Engineer as suitable for open storage.
- 14.1.3. The Contractor must write the following items on all packages, but not limited to them.
 - (1) Name of packing content
 - (2) Quantity of packing content
 - (3) Size and weight of package
 - (4) Precautions of package handling
 - (5) Packing number or contract number

- 14.1.4. The Contractor must prepare a packing list and check it at the time of both shipment and delivery.
- 14.1.5. When the Contractor delivers a package from a temporary site to an actual use site, the Contractor must deliver it carefully by grasping its packing contents and observe strict precautions of package handling.

14.2. Crating

- 14.2.1. The Contractor shall provide all packing, crates, and marking. The consignments for shipment shall be packed and marked in accordance with the Engineer’s instructions. In doing so, it shall comply with the following requirements;
- (1) Each case, crate, or package shall be waterproof, rot-proof, and insect/rodent-proof, of robust construction, and suitable for the intended purpose. The Contractor shall, in determining the packing materials to be used, take cognizance of the climatic conditions likely to occur during the period of transport, shipment, and storage.
 - (2) Each case, crate, or package shall be legibly and indelibly marked in large letters with the site address, Contract number, “right way up”, opening points, and other markings as necessary to permit materials to be readily identified and handled during transit and when received at the Site.
 - (3) Each case, crate, or package shall contain a comprehensive packing list showing the number, mark, size, weight, and contents together with any relevant drawings. A second copy of the packing list shall be enclosed in a watertight enclosure on the outside of each case or package. The distribution of additional copies of each packing list shall be in accordance with the Engineer’s instruction.
 - (4) All items heavier than 100 kg shall be marked on the outside of the case to show the gross and net weights, the points for slinging, and where the weight is bearing.
 - (5) Care shall be taken to prevent movement of items within cases, crates, or packages by the provision of bracing, straps, and securing bolts as necessary. Bags of loose items shall be packed in cases and shall be clearly identified by well-secured metal labels on which the quantity and name of the part and its index or catalogue number have been stamped.
 - (6) Plug connected electronic circuit boards shall be removed from their racks, packed, and shipped separately.
 - (7) All packing shall be free from sharp edges to prevent injury to persons or other objects.
 - (8) Each bulky/heavy case, crate, or package shall include wedge(s) for easy loading and unloading by mechanical handling equipment such as a forklift truck.
 - (9) Electronic circuit boards, integrated circuits (IC), and the like shall be well protected by using appropriate packing, e.g., anti-static bubble bag or similar.
 - (10) Rubber products and the like shall be suitably packed to avoid damage including but not limited to hardening, deformation, and peel-off.

14.3. General Precautions

- 14.3.1. Spare parts shall be tropicalized in their packing for prolonged storage in accordance with appropriate international standards and shall be suitably and individually labeled to indicate:

- (1) shelf life and date of manufacture;
- (2) type or condition(s) of storage and special handling information;
- (3) description of item and relevant part number;
- (4) serial number, if applicable;
- (5) inspection/test certificate number and batch number; and
- (6) Contract number, variation order number, and item number.

14.3.2. Tubes, cable, and conductor ends, and other similar openings shall be properly sealed and blanked off to prevent ingress of dirt or moisture. Flanged ends shall be protected by adhesive tape or jointing material covered by a properly secured wooden blank not smaller than the flange itself. Plain tube ends shall be closed off with bungs or plugs or suitable materials firmly fixed in position.

14.3.3. Particular care shall be taken to prevent mechanical transport-related damage or corrosion of shafts and journals where they rest on timber or other supports which may contain moisture. At such points, wrappings impregnated with anti-rusting composition and of sufficient strength to resist chafing under the pressures and movements during transit shall be used.

14.3.4. Spare ball and roller bearings and similarly protected items shall not be removed from the manufacturer’s wrappings or packing.

14.3.5. Fragile materials shall be packed in such a way that they shall not be damaged during transit and when they are properly unpacked for quality inspection. Glass items shall be capable of being easily re-packed without removing the original wrappings or packing for long-term storage within the same packing case.

14.3.6. Appropriate precautions in accordance with the Contractor’s safety regulations, the regulations of the Employer, and statutory regulations shall be taken in respect of all hazardous, toxic, inflammable, etc. materials.

14.4. Packing Procedures

14.4.1. All required inspection/test certificates shall be supplied and packed together with individual material. All packaging materials and procedures shall be subject to review by the Engineer.

14.4.2. All empty cases, crates, or packages, whether or not returnable, shall be removed from the Site by the Contractor or stored by the Contractor in such a way that they do not interfere with the progress of the works of the Contractors.

14.5. Shipping

14.5.1. The Contractor shall notify the Engineer ten (10) days in advance of any expected shipment date and give further notification of the actual shipment date and routing when such information is subsequently established. This shall complement the inspection requirements prior to delivery as specified herein.

14.5.2. Two copies of packing lists and quality certificates shall be attached to each case or package to be shipped. One copy shall be placed inside the package and the second copy shall be enclosed in a watertight enclosure on the outside of each case or package. A copy

of packing lists and quality certificates shall be sent to the Engineer after each package of the Works, the equipment, spare parts, and other items to be shipped have been shipped.

14.5.3. Without prejudice to any other provisions of the Contract, and unless otherwise specifically described, the Contractor shall be responsible for all legal requirements, duties, dues, taxes, and other such requirements and expenditures required for the importation of the Works, the equipment, spare parts, and other items to be supplied under the Contract into Republic of the Philippines.

14.5.4. The Contractor shall clear the Works, the equipment, spare parts, and other items to be supplied under the Contract through Republic of the Philippines’ customs/ Philippine port in accordance with all Government of Republic of the Philippines’ Enactments.

14.6. Delivery

14.6.1. The Contractor shall deliver the materials/equipment and all items to be supplied under the Contract to the Site.

14.6.2. The Contractor shall unload the materials/equipment and all items to be supplied under the Contract at the designated delivery point and positioning or storing them.

14.6.3. Any part of the materials/equipment or any item to be supplied under the Contract that is damaged in transit shall not be considered as delivered until repairs or replacements have been made and all necessary spare parts or items have been delivered to the Site.

14.6.4. All documents, manuals, drawings, and other deliverables shall be delivered to an address in the Republic of the Philippines to be designated by the Engineer in writing.

14.6.5. The Contractor shall store and secure the Works, material/equipment, spare parts, and other items until the same has been inspected and are considered delivered at the designated point by the Engineer.

14.6.6. The Contractor shall remove temporary fittings required for shipment and re-assembly of equipment and shall complete this prior to the equipment or parts thereof being inspected and before they are considered delivered.

14.6.7. An item shall be considered delivered when all damages have been repaired and all documentation and post-delivery preparation have been completed to the satisfaction of the Engineer.

15. TRAINING

15.1. General

15.1.1. The Contractor shall be required to train, or arrange training for, selected members of the Employer’s Railway Operations staff in accordance with the requirements of the Railway Operator’s program. These staff will include the Employer’s and the Railway Operator’s Instructors who will require training in technical matters according to their intended function and in instructional techniques. An important objective of the training is to increase the ability to operate, control, supervise, and carry out maintenance work on Plant and Equipment supplied and installed by the Contractor.

15.2. Training Requirements

- 15.2.1. Contractors shall be required to provide the following four (4) types of training:
- (1) Training for Experts who will be instructors
 - (2) Training for OCC staff
 - (3) Training for station staff
 - (4) Training for technical staff including Railway Systems operation and maintenance staff
- 15.2.2. The Contractor shall provide training for OCC staff and station staff before the Trial Runs or Trial Operation.
- 15.2.3. The Contractor shall consider the methodology of the knowledge transfer. Knowledge includes not only the system itself but also matters related to the operation.

15.3. Training Periods

- 15.3.1. The Contractor shall propose appropriate man-months of training to be provided along with rates for adjustment to these requirements. The rates shall include, but not be limited to, providing instructors, training facilities, and all teaching aids, materials, and equipment necessary to fulfill the training requirements.

15.4. Language of Training Courses

- 15.4.1. All training courses will be conducted in English.

15.5. Training Instructors

- 15.5.1. The Contractor's training instructors shall be fully qualified and experienced electrical and mechanical engineers, who have a good knowledge of the English language. They will have had the experience of training engineers or technicians of the level stated on similar topics and will be fully familiar with the Plant and Equipment supplied and installed in the Works.

15.6. Contractor's obligation to obtain Approval of Instructors

- 15.6.1. Should, in the opinion of the Engineer, any of the Contractor's training instructors not be considered as competent or do not have suitable language skills, attitude or aptitude for carrying out the training courses for whatever reason, the Contractor shall remove the said person and replace him as soon as possible with an acceptable substitute.

15.7. Employer's Railway Operations Staff

- 15.7.1. Where the Employer's or the Railway Operator's staff (trainees) will be assigned to the Contractor (or his Subcontractor(s)) for the purposes of training. All such trainees must be properly supervised and monitored by the Contractor and/or Subcontractor's qualified training supervisor to ensure that each trainee has the best opportunity to benefit from the theoretical and practical experience.

15.8. Training Program

- 15.8.1. The Contractor shall develop and plan detailed training programs using training methods most appropriate to the subject matter and the level of trainee specified. Details of these

training programs shall be submitted to the Engineer not later than six (6) months from the award of Contract. The objectives, content, method, location, timing, and duration of each program as provided in the Contractor's proposals.

15.9. Training Courses

15.9.1. The Contractor's training courses shall be programmed in phase with the progress of manufacture and installation to ensure that trainees are present during all stages of the manufacture, installation, testing, commissioning, and integration testing of the Plant and Equipment that is the subject of the training program. The Contractor shall ensure that the courses fully encompass all aspects of the basic design and operation principles, manufacture, installation, testing, commissioning, and maintenance of the Plant and Equipment with maximum effort being directed at instruction in the maintenance of the installed Plant and Equipment.

15.10. All Necessary Railway Operational Instruction Aids and Material

15.10.1. The Contractor shall use all necessary teaching aids such as technical literature, manuals, photographs, drawings, films, models, and all other instructional materials as may be necessary for the training of the Railway Operator's personnel. Instructional use in the performance of Training will become the property of the Employer for the purposes of Railway Operations and Maintenance.

15.11. Plant and materials set aside for Training Purposes

15.11.1. In general, the Contractor shall use Plant and materials specifically set aside for training purposes. However, the Contractor may use, for the training of the Railway Operator's staff, subject to the agreement of the Engineer, Installed Plant and Equipment when no other such plant and materials are otherwise available. The Contractor shall not use for this purpose and spare parts or assemblies that form the O&M Spares.

15.12. Protective Clothing-Training

15.12.1. The Contractor shall provide all special or protective clothing required by the trainee; undergoing instructed training. Personal items of clothing shall be of new issue and may be retained by the trainee on completion of the training course.

15.13. Monitoring

15.13.1. Throughout the training program, the Engineer shall have free access to all training sessions to monitor the progress of the trainees and the Contractor's training instructors.

15.14. Training Practical Tests and Aptitude Reports

15.14.1. To ascertain that the objectives of the courses have been achieved the Contractor shall set periodical theoretical and practical tests for the trainees. The results of these tests together with a report on the trainees' general attitude, ability, technical knowledge, aptitude, and attendance record shall be forwarded at regular intervals to the Engineer who may also require the submission of additional reports in special cases.

15.15. Monitoring of Training Progress

15.15.1. Methods for monitoring progress shall include, but will not necessarily be limited to:

- (1) Theoretical tests and systems of assessment;
- (2) Practical test pieces and objective systems of assessment;
- (3) Progress reports.

15.16. Records of Training Progress to be Maintained

15.16.1. Records of the progress of trainees shall be kept up to date and shall be made available to the Engineer for examination when required.

15.17. Issue Test Results and progress to the Engineer

15.17.1. Copies of the records of individual trainees, showing all test results and reports of progress, shall be sent to the Engineer on completion of each training course.

15.18. Training Location and Facilities

15.18.1. The training of selected Employer’s and Railway Operator’s staff shall be carried out at such locations where the greatest benefit for trainees may be gained. This may be in the Republic of the Philippines or at places of manufacture, assembly, or testing or such other locations as may be necessary. All places of training shall be approved by the Engineer. Details of the facilities to be provided shall be included with the detailed training programs submitted by the Contractor.

15.19. Occupational Health and Safety of Trainees

15.19.1. The Contractor shall be responsible for the safety, health, and welfare of trainees when under training. Accordingly, an explanation of the safety rules and codes shall form part of a general induction course to be given by the Contractor and where considered necessary the Contractor shall issue a rulebook for which the trainee shall sign indicating his acceptance and understanding thereof. This shall include a specific COVID-19 Risk Management Plan which shall be issued with the bid and resubmitted within 28 days of Award of Contract. This resubmission shall contain modifications to reflect the changes which have occurred between the Date for Submission of the Bid and Award of Contract.

15.20. Administration

15.20.1. The Contractor shall be:

- (1) Responsible for the reception of, and hotel and travel arrangements for each trainee in regions other than Manila;
- (2) Responsible for the general welfare of trainees under its control.

16. SITE OFFICE AND SITE OFFICE MANAGEMENT

16.1. Site Restrictions

16.1.1. The particular use to which the Site is put shall be submitted to the Employer together with the Engineer for review with the following particulars:

- (1) drawings showing the layout of the Site Office for the Contractor, accommodation, access roads, and major facilities;
- (2) drawings showing the layout and the construction details of the Employer’s and Engineer’s office; and
- (3) proposals for the Employer’s and Engineer’s Site accommodation as defined by Clause 1 ~~6.2~~ ~~5.2.1~~ and ~~15.2.2~~ below.

16.2. Site Office Facilities

16.2.1. Employer’s and Engineer’s Site Offices

The Contractor shall provide two joint Employer’s and Engineer’s site office, one located in the MCRP section and the other in the NSRP South section.

Both offices in the MCRP and NSRP South sections shall be provided within 90days prior to the first access date for each section. The site office shall have spaces for the 40 vehicles.

The locations, layout drawings, and specifications for the offices and other facilities shall be submitted for review and approval to the Engineer 180days before the scheduled first access date or to coincide with the Contractor ‘s planning of their respective offices,

The Employer’s and Engineer’s site office shall have sufficient space for forty (40) staff excluding the office support staff (e.g., Secretary, Janitors, Administrative Personnel, IT, etc.) equipped with following facilities:

- (1) Air conditioning units. (Adequate and sized relative to the office size and number of occupants.)
- (2) Office Furnitures: 40 Desks with Drawers and chairs, (plus 10 spares for open assignment or transient office workers), 2 meeting tables, 25 portable chairs, Filing Cabinets, etc.
- (3) 2 -Meeting rooms with Noise-Reduction panels, whiteboard, and projector. (Fully equipped 1- large room for 10-12 persons, and 1 -small room for 5-6 persons).
- (4) 1- Pantry Room with Dining Facility. (Fully furnished with kitchen sink with faucet and drain system including grease trap, microwave oven, refrigerator, hot/cold water dispenser (with consumable purified water), pantry cabinet with utensils organizer, pantry cleaning materials, and consumables.
- (5) 1- Break Room. (Fully furnished with sofa, tables, chairs.)
- (6) 1- E&M Equipment and Office Storage Room. (Equipped with Lockers)
- (7) Separate Toilet and Bath Facilities for both Gender (Prefabricated Cabin Toilet, composed of water closet (Western /European type) with spray hose and flushing system, washbasin with mirror, urinal with flush valve (for male toilet), bath shower, electrical inlet connections, waterproof emergency light, exhaust fan, steps/ladder, non-skid flooring with drains, toilet & bath cleaning equipment/materials and consumables, tissue paper holder, towel holder and hooks, liquid hand soap, sanitizer

and tissue paper.

- (8) Computer network system with 5 Desktop Computers (8-Core Processor / 32GB RAM / CUDA Accelerated Graphics with 8 GB of VRAM) and Monitors (29”) and associated equipment. (Includes Telephone lines, Internet Wi-Fi, Conference Call equipment, Projector, licensed software, extension cords, etc.)
- (9) 2 no’s Photocopy machines, 2 no’s printers and its consumables.
- (10) Adequate office lighting and electrical power outlets.

The Contractor shall be responsible for the maintenance of the Employer’s and Engineer’s site office with support staff knowledgeable of administration and IT functions and provide office cleaning (Janitorial) services. The Contractor shall supply all the necessary office equipment and stationery including paper for photocopy machine, electricity, drinking water, coffee, and other office facilities supplies, and consumables need by the Employer and Engineer.

The office and parking area shall be accessed by a temporary concrete road connecting to the Public Street or Highway. A concrete pathway shall be provided on all sides of the office.

16.3. Site Management

16.3.1. The particular use to which the Site is put shall be submitted to the Engineer in form of a plan for site facilities for review within 120 days after the Commencement Date. The Contractor shall:

- (1) confine his use of the areas of the Site to purposes having been Approved by the Engineer who reserves the right to extend, amend or restrict the uses to which areas of the Site will be put;
- (2) where required under the Contract, provide and maintain fencing and lighting around and within the areas of the Site when or where necessary for the safety and convenience of the public or others or as directed;
- (3) refrain from depositing rubbish or causing nuisance or permitting nuisance to be caused and, except where reviewed and Approved by the Engineer, depositing earth on or removing earth from areas of the site;
- (4) refrain from felling trees, other than those specifically identified in the Contract to be felled, and refrain from depositing earth around the trunks of trees and protect all trees remaining on-site to the satisfaction of the Engineer;
- (5) except where otherwise provided, not permit any person to reside on the site;
- (6) not use any part of the Site or the Works for advertising purposes except with the acceptance of the Employer and Engineer.

The Site shall be maintained in a clean and tidy condition. Materials, including those required for temporary works, shall be stored in an orderly manner. The Contractor shall, throughout the period of the Contract, provide a central collection point on site for collecting all empty cans, drums, packing, and other receptacles capable of holding water. The Contractor shall ensure the regular collection and removal of such debris from the site. After every shift of works, all work areas shall be cleaned and made tidy to the satisfaction of the Engineer. The Contractor shall ensure that gases, fuels, explosives, and other dangerous goods are stored and handled in a safe manner and in accordance with

the statutory regulation pertaining to their storages and handlings. The Contractor shall be responsible for obtaining the requisite licenses at his own cost.

- 16.3.2. The Contractor shall provide all necessary protective clothing, safety equipment, hand tools, ladders, trestles, power supply, and replacement equipment for the Employer and Engineer staff engaged in Site Inspection and Maintenance (Protective clothing, safety boots, high visibility vests, safety glasses and safety field kits for 120 personnel and 20 spares). For specific activities such as working at heights, a safety harness shall be provided.
- 16.3.3. Because of the multi-disciplinary nature of the project, several different parties may require access to the same portion of the Site during the construction phase, for the installation, erection, and testing of the Works. To facilitate the organization and coordination of access and occupation requirements, the Contractor shall maintain a close liaison with other contractors.
- 16.3.4. As soon as any or all of the Contractor's installations, including offices, are no longer required for the execution of the Works, the Contractor shall with the agreement of the Engineer remove those facilities and ensure that the area is left free of debris, excess materials, and obstructions.

16.4. Services

- 16.4.1. The Contractor shall provide Electricity, Water, and Gas to the Site Office(s) as part of the Operating and Maintenance expenses.
- 16.4.2. The Contractor shall also provide the emergency electricity supply equipment at his risk and cost. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed. The Contractor shall pay, or reimburse at actual costs, the fees for the quantities consumed of such utilities, as applicable. The Contractor shall comply with all regulations of the utility companies and Government departments concerned and the rule of the Employer for usage of such utilities.
- 16.4.3. If lighting is not provided in the specific areas allocated to the Contractor, he should make his own arrangements. The Contractor shall be solely responsible for the security and housekeeping of the area, plant, and possessions allocated to him. The Contractor shall provide and maintain all facilities required by him in the area allocated for his use and all other work required to allow the Contractor to fulfill his obligations under the Contract.
- 16.4.4. The Firefighting and First-Aid equipment shall be provided in accordance with the recommendations of the Employer and Engineer. (Examples: Fire-Extinguishers, Fire-Blanket, First-Aid kits, etc.)

16.5. Accommodation

The Contractor shall provide suitable living accommodation for eight (8) staff from the Employer and eight (8) staff from the Engineer in the vicinity of the working location. The location of the accommodation shall move progressively based on the working location. The accommodation shall be provided from six (6) months prior to first site access to issuance of the final Taking Over Certificate.

17. ROAD TRAFFIC AND TRANSPORTATION

17.1. General

- 17.1.1. The Contractor shall conform to the applicable requirements under the law, act, regulations, and decision issued by the Government of the Republic of the Philippines and/or the Governmental authorities and imposed in the Republic of the Philippines. The Contractor shall ensure compliance with the requirements regarding the registration of vehicles. Vehicle size and load limitations shall be in accordance with all statutory requirements.

17.2. Transportation to Site

- 17.2.1. The Contractor shall make all arrangements and assume full responsibility for transportation to the Site of all plant, equipment, materials, and supplies needed for the proper execution of the Works. Procedures for the access to and from the Site shall be coordinated with the relevant authorities if required.
- 17.2.2. The Employer will obtain any required permits or licenses from relevant authorities for the import of the Goods intending to form or forming part of the Permanent Works or required for the sole purpose of carrying out the Works. Furthermore, the Employer shall assist the Contractor in procuring any necessary Government consent and in obtaining clearance through Customs of the Goods imported for the Works. The cost of any permits shall be borne by the Contractor.
- 17.2.3. If requested by the Contractor, the Employer shall facilitate the transport of the imported items for Railway System works, via railway from Manila Port or an available nearest port to the Site, which, however, will not relieve the Contractor of any of his obligation under the Contract. The Contractor shall inspect the condition of Railway System equipment at Manila Port or an available nearest after customs clearance and also at the Site when arrived at the Site.
- 17.2.4. The Contractor shall use such routes and rights of access to the site as proposed by the Contractor and agreed by the Engineer from time to time. Routes for 'very large' or 'very heavy' loads shall be discussed with the Engineer in advance and all arrangements thereafter shall be submitted to the Engineer. In this context, the definition of the terms "very large" and "very heavy" refers to articles that cannot be transported by normal road vehicles or be handled by readily available methods.
- 17.2.5. The Contractor shall be responsible for obtaining permission from the traffic police and other relevant authorities to move “very large” and “very heavy” loads and for arranging police escorts if required. The Contractor shall ensure that all roads and pavements, etc. leading to and around the Site are kept free from obstructions and shall not cause inconvenience or hindrance to traffic or persons either by its vehicle or its workmen, scaffolding, plant, materials, equipment, etc. All workmen working on the road shall wear approved reflective safety vests at all times.
- 17.2.6. The Contractor shall repair damage caused to existing roads, footpaths, steps, cables, sewers, drains, etc. and shall reinstate the same at his own expense to the satisfaction of the relevant authorities.
- 17.2.7. Access road planning during construction/installation time in viewpoint of maintaining work progress for supply of materials and manpower, removal of construction disposals through public roads outside of MCRP & NSRP-South and railway in MCRP & NSRP-

South. It is required to secure transportation access from major roads for this project works.

- 17.2.8. Traffic Control Plan should be prepared and developed by the Contractor before or during the construction time. The Contractor strictly shall apply the plan with taking prior permission from the Employer, the relevant agencies, the Engineer / the Project Manager, and taking consent from the residents concerned.
- 17.2.9. The major access routes for construction vehicles will be the trunk road running in parallel with the MCRP and NSRP-South line. It is required to have some alternative plans to prevent the access roads from passing through high population and public density areas, such as residence and commercial areas, school, and hospital areas.

18. MEETING REQUIREMENTS

18.1. General

The Employer and the Engineer will conduct project meetings throughout the Contract period to enable an orderly review of the progress of the Works to be undertaken, and to provide for a systematic discussion of problems and issues if any.

Besides the project meetings above, the Employer and the Engineer will also conduct regular technical, construction and commissioning meetings with the Contractor at least once a fortnight at a location designated by the Engineer.

The Contractor shall also arrange and attend meetings as required by the Engineer.

The Contractor shall endeavor to ensure that his Subcontractors, suppliers, and sub-consultants attend meetings when so required.

As for the meetings not included in this requirement, such as the Contractor's relations with his Subcontractors and materials suppliers, and discussions relative thereto, these matters are the Contractor's responsibility and shall not be a part of project meetings content.

Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

To the maximum extent practicable, the Contractor should advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.

The Contractor shall compile minutes of each meeting and within 5 days furnish three copies to the Engineer for review and acceptance . The Contractor may make and distribute such other copies as he wishes.

All meetings shall be scheduled as per requirement. However, generally, Project progress and track possession meetings will be held monthly, and site meetings and the operating meetings fortnightly. Necessary coordination shall be made to establish a mutually acceptable schedule for meetings.

To the maximum extent practicable, monthly meetings will be held at the Engineer's Office, and site meetings at the Engineer's site office.

18.2. Monthly Progress Meetings

The Monthly Progress Meetings will be held at dates, intervals and times as determined by the Engineer. The agenda for the monthly progress meeting shall follow the contents of the Monthly Progress Report. It may also be necessary to hold review meetings at regular intervals at management levels as deemed necessary by the Engineer. Such meetings shall generally be arranged at the place of activity concerned.

18.2.1. Attendance: To the maximum extent practicable, the same person or persons who shall represent the Contractor at project meetings shall attend throughout the progress of the Works including the person responsible for Document Control. Subcontractors, material suppliers, and others may be invited to attend those project meetings in which their aspects of the Works are involved.

18.2.2. The Contractor shall submit a Project Progress Report to the Engineer. The Project Progress Report shall be prepared in accordance with the Engineer’s requirement and shall include, but shall not be limited to, the following items:

(1) Executive Summary

A summary of major events, overall progress, delays, recovery and financial matters. The Contractor’s organization chart highlighting any changes to key personnel.

(2) Contract Summary

Contract Particulars and Variation Orders. This section shall contain detailed information about the financial and commercial status of the Contract, including details of actual and anticipated claims covering cost and time extensions.

(3) Design Progress / Manufacturing Progress / Installation Progress / Testing and Commissioning Progress / Trial Operations;

A summary of the Contractor’s manufacturing / installation progress with details of any areas of concern or delay and any areas of technical difficulties incurred or expected to be specifically highlighted, together with details of the Contractor proposals for corrective actions. A summary of manpower, plant and equipment on site shall also be included.

(4) Design

Summary, including critical design issues and interfaces and status of design submissions.

(5) Manufacturing Status

This section shall contain detailed descriptions of all manufacturing achievements in the month including any problems encountered, comparing the planned works with the actual works.

(6) Procurement and Delivery Status

This section shall contain the detailed progress of all procurement items and delivery activities (construction and permanent plant), both planned and actual.

(7) Discussion on any other business.

(8) Environmental Management

(9) Quality Assurance and Quality Control

- (10) Progress Videos and Photographs
- (11) Updated Baseline Programme with progress update status as at the report cut-off date as specified by the Engineer.
- (12) Risk Management / Register Report
- (13) Other items as required and to be advised by the Engineer.

18.3. Programme Analysis Report

18.3.1. The Contractor shall submit a Programme Analysis Report to the Engineer together with the Monthly Progress Report and all related programme submissions which shall comprise a narrative statement that identifies the basis of the Contractor assumptions and to include:

- (1) The content required to be included in any programme or supporting document needs to be clearly identified and described to ensure a clear understanding of the scope / requirements of each document provided, i.e., activity detail and activity durations, sequence of working etc.
- (2) The critical path of the Works;
- (3) Daily and weekly working hours, holidays and shift patterns;
- (4) Assumed production outputs for all major activities and areas of the Works.
- (5) An overall manpower forecast detailing individual traders and other sub-contract / indirect labor, commissioning teams etc. to illustrate the build-up of manpower resources. The format is to be in accordance with the Engineer’s requirements;
- (6) List of major items of plant or equipment that are required to be procured identifying the required lead times;
- (7) S-curves and histograms showing the planned weekly figures for each principle quantity, major items of equipment and major manpower trades;
- (8) Any programme constraints, giving details of the constraints and the substantiation thereto;
- (9) When supplied with a Three Month Rolling Programme or current Baseline Programme, it shall include a summary of progress achieved in the previous period in terms of principle quantities (planned versus actual) and time gain / loss in terms of days for each activity;
- (10) All computerized network diagram and bar chart updates shall be accompanied by the following output reports;
 - A complete listing of activities sorted by sub-network early start . early finish with total “float time” calculated for each:
 - A tabular report of design submittals;
 - A tabular report of test, demonstrations inspections; and
 - S-curves indicating the “scheduled” and “actual” progress in a cumulative fashion, the schedules progress curve shall be prepared to show early and late profiles.
- (11) Outline installation method statements;
- (12) Details of access and working arrangements, in particular with interfacing parties;

- (13) Assumed periods for dealing with third party works such as utility companies, interfacing contractors or statutory bodies etc.;
- (14) Details of the proposed sub-contract arrangements;
- (15) Coding libraries and structures;
- (16) Programme recovery / mitigation analyses.

19. LIAISON WITH OTHERS

19.1. Approvals from Government Authorities and Agencies

The Contractor shall assist the Employer to make all necessary arrangements with and obtain all necessary approvals from Government departments, utility agencies, and other relevant competent authorities.

19.2. Meetings with the Engineer

The Contractor shall arrange and attend meetings as required by the Engineer. The Contractor shall use its best endeavors to ensure that its Subcontractors, suppliers, and sub-consultants attend meetings when so required.

19.3. Meetings with the O&M Concessionaire

The Contractor shall arrange and attend meetings with the O&M Concessionaire. These meetings shall commence from the time the O&M Concessionaire is appointed until the end of the Defects Notification Period.

19.4. Meetings with Government Departments and Agencies

When the Contractor arranges meetings with External Interfacing Parties including government departments and utility undertakings or Interface Contractors, it shall inform the Engineer at least four (4) official working days (excluding general holidays) or such shorter period permitted by the Engineer, before they are to be held and shall give the Engineer and the Employer the agenda and objective of the meetings.

19.5. Correspondence with Government Departments and Agencies

Copies of correspondence received from or dispatched to Government Departments, utility undertakings, and Interface Contractors shall be submitted to the Engineer for information within two (2) days of receipt or dispatch.

20. INTERFACE MANAGEMENT

20.1. General

The Contractor’s responsibility for interface coordination shall include interfacing with the previously described Interface Contractors and those who may be identified in the future such as local authorities, statutory bodies, utility undertakings, private service providers, consultants, or other contractors whether or not specifically mentioned in this Contract. This responsibility is not limited to a particular number of Interface Contractors.

Each of the Project Contractors shall be responsible for coordinating their own works with those of Interfacing Contractors, Statutory Authorities and other External Parties, whether or not specifically identified herein, and in order to do so, they are required to participate in an information transfer and management process in accordance with the procedure given below.

The System-Wide E&M Works are the most significant element of the Interface Information flow requirements; therefore, the Contractor shall take a pivotal role in the overall Interface Management process of the Project.

Appendix 7 contains the Outline Interface Matrix (OIM) with the respective civil packages from which the Contractor shall subsequently develop a consolidated draft Detailed Interface Matrix and shall convene the first of a series of regular Interface Coordination Meetings which will be chaired by the Engineer and shall be attended by all interfacing Contractors. The consolidated document shall be reviewed and revised following these meetings and shall be released as a Consolidated Detailed Interface Matrix (CDIM), which will be monitored and used for Interface coordination and progress monitoring. The CDIM shall include all interfaces i.e., Intra System Interfaces, Inter-systems, and external Interfaces.

The Contractor shall develop an Outline Interface Matrix (OIM) for each of the following but not limited to:

- a) Track Works
- b) Signaling System.
- c) Telecommunications
- d) Power Supply system at substations.
- e) Power Distribution System
- f) Overhead Contact line System
- g) Automatic Fare Collection System
- h) Depot & Workshop Facility installation at depots.
- j) Platform Screen Doors
- k) any other system under the scope of work or specified elsewhere in the contract.

The CDIM will continue to be a live document, subject to modification and addition by common agreement between the Package Contractors as the Works proceed

The Contractor shall prepare detailed System Architecture Drawings (SAD) covering all areas of scope included in the Contract. Level 0, Level 1, and Level 2 SAD’s shall be submitted and given a Notice of No Objection during the preliminary, pre-final, and final design stages respectively.

20.2. Exchange of Information with Interfacing Contractors

The Contractor shall communicate, coordinate, and exchange information directly with Interface Contractors. Information necessary to fulfill the Contractor’s interface obligations shall be directly requested and obtained from the Interface Contractors; receipt and acknowledgment procedures is required. Conversely, the Contractor shall provide directly to the Interface Contractors information within the Contractor’s scope.

The Contractor shall develop and submit for approval by the Engineer an Interface Control Document for each sub-system and Other Works Contractor. 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. It shall be signed off by the Contractor, his sub-contractors, and the interfacing Contractors, prior to submission. The submission date of each Interface Control Document shall be coordinated with that of the respective other parties. The Interface Control Document shall:

- a) Clearly identify the demarcation between the sub-system, his subcontractors, and Other Works Contractors;
- b) Describe detailed physical, electrical/ mechanical, and functional interfaces (such as protocols, software, and data structures) between the sub-system, his sub-contractors, and Other Works Contractors;
- c) Identify the information to be exchanged between the sub-system, his sub-contractors, and Other Works Contractors with a timeline that complies with the overall Project program as well as the contracts of the respective parties;
- d) Define Design, Manufacture, Supply, Installation, Testing, and Commissioning responsibilities;
- e) Address the Design, Manufacture, Supply, Installation, Testing and Commissioning program of the interfaces to meet the key dates of each contract, and highlight any program risks requiring the Engineer's attention;
- f) Specify the proposed method and schedule for verifying interface integrity along with any requirements, whether temporary or permanent, relating to the physical installation of each party's equipment or materials used for the Works; and
- g) Include test procedures and a program to demonstrate the performance and integrity of the integrated systems.

The Contractor shall communicate and co-operate with the Interface Contractors to identify and resolve potential interface problems.

The Contractor shall allow for the fact that many of the design activities of the Interface Contractors may proceed concurrently to the construction of this Contract. Specific dates for the delivery of this and other required information shall be confirmed between the Contractor and the Interface Contractors.

The Contractor’s program shall allow for the timing of availability of necessary interface information from the interfacing parties.

20.3. Request for Information

All requests for information (RFI), acknowledgment of receipt of information, and any official communication between the Contractor and the Interface Contractors shall be made in writing with a copy to the Engineer for information.

20.4. Interface and Co-ordination with Interfacing Contractors

The Contractor shall advise the Engineer in writing of any problems encountered in obtaining necessary information and/or lack of co-operation from any Interface Contractor. In the event that the Engineer considers that the resolution of an interface is not proceeding satisfactorily, the Engineer will review the matter and establish a coordinated plan directing the Contractor and the Interface Contractors as to the required

action.

20.5. Meetings with Interfacing Contractors

The Contractor shall conduct regular meetings with the Interface Contractors to clarify particular aspects of the interface requirements of the Contract Works and the related works. The party who convenes the meeting shall prepare minutes recording all matters discussed and agreed at the meeting. The Contractor shall advise the Engineer in advance of the date, time, and location of such meetings as he may elect to attend.

20.6. Issuance of Information Related to Interfaces and Coordination

The Contractor shall ensure that copies of all correspondence, drawings, meeting minutes, programs, etc. relating to the Contractor’s coordination with Interface Contractors are issued to all concerned parties and the Engineer no later than two (2) calendar days from the date of such correspondence and meetings.

20.7. Liability for Failed Interfaces

Any claim of additional costs by Interface Contractors resulting directly from the Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and updating of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each stage of the Works.

20.8. Design Co-ordination with Interface Contractors

The Contractor shall undertake design co-ordination with Interface Contractors within periods for design interfacing and coordination. The Contractor may commence design interfacing with Interface Contractors prior to the given period once information has been developed to a level where meaningful interaction can take place. The end of the design interfacing and co-ordination period indicates the deadline for receipt by the Engineer of a notice from the Contractor and each of the Interface Contractors stating that design co-ordination has been completed and that designs have been reviewed to ensure consistency between the designs proposed by the Contractor and the respective related Works Contractor. Typically, design interaction should include the followings:

Definition and agreement with Interface Contractors of interface areas, Contract limits, shared loads, physical work interfaces, sequence of installation, and or testing of systems.

The Contractor shall fully co-ordinate the design of the Contract Works with the design of Interface Contractors and shall follow the interfacing requirements detailed in the Technical Requirements (ERT).

The Contractor shall ensure that the requirements of each Interface Contractor are fully coordinated and provided for in the design of the Contract Works. The Contractor shall interface and liaise with Interface Contractor and other contractors in accordance with the requirements of the Technical Requirements (ERT).

Definition and design approach by the Contractor with Interface Contractors for civil and structural works or type, size and location of equipment and control rooms, access routes thereto, embedded ductwork and other cast-in items such as lifting hooks and eyes, fixing bolts and sockets, agreement of installation programming, preparation of coordinated

installation plan, etc. shall be done.

Where an Interface Contract is yet to be awarded, the Contractor shall proceed with the coordination activities with the Engineer until such time as the Interface Contractor is available. The Contractor shall provide the Interface Contractor with all information necessary to enable the Interface Contractor to follow-on and proceed with their co-ordination.

20.9. Construction Interfaces and Co-ordination

The Contractor shall undertake installation during periods for installation interfacing and coordination. The installation interface and co-ordination period indicate when its Subcontractors and/or Interface Contractors shall have access to areas within works areas for Interface Contractors to undertake their work. It shall be incumbent on the Contractor to define more closely with Interface Contractor the details of its activities within areas where work is to be carried out and to require the same to be described in interface documents. During the installation interface period, the Contractor shall have priority in working within areas to which access has been granted. The end of the installation interface period indicates when the Contractor shall finish its principal installation work within the given areas to which access has been given.

The Contractor shall coordinate and cooperate with Interface Contractors on all site-related matters including but not limited to site access and occupation, safety, verification of work compatibility, and survey control. The Contractor shall advise the Interface Contractors in advance when a construction item is ready for field inspection to verify compatibility with the interfacing parties’ needs and shall facilitate access to the Site for the Interface Contractors.

On advice from the interfacing parties that an as-constructed interface-related element is ready for inspection, the Contractor shall:

- Conduct on-site inspections of the work elements and give comments in writing to the Interface Contractors.
- Agree in writing to the interfacing parties that the as-constructed work meets the interface requirements.

20.10. Interface Management Plan

Interface Contractors are listed in Section 4.3.1 of this ERG are to be included in Interface Management Plan and the Organization Chart (Interfacing).

The Contractor shall fully co-ordinate the design of the Contract Works with all relevant bodies and entities, in particular government authorities, departments and regulatory bodies, utility companies, and the consultants and contractors of adjacent Projects whether ongoing or planned.

Interface issues and their resolution shall be regularly addressed in the Monthly Progress Report. All submissions shall conform to interface requirements.

As a minimum, the IMP shall contain the content as in Table 20.1 below. The intention of each section of IMP is described by the text inside the right-hand column in *italics*.

Table 20.1: Interface Management Plan

1	Introduction	
1.1	Purpose of the Document	Describe the methodology to be adopted by the Contractor in managing all interface issues
1.2	Overview	Project overview of the Contractor and Interface Contractor interfaces
2	Resource Management	
2.1	Organization and Roles & Responsibilities	Description of organization structure
2.2	Resource Requirement	Detailed description of the manpower, tools, logistics shall be included in this section
3	Interface Requirements	
3.1	Allocation of Interface Requirements	This is an introduction to Section 3.2 below
3.2	Interface Description between Contractors	Outline Interface Matrix (OIM) shall be included in this section
3.3	Areas of Concern	Process for managing the interface concern
4	Process Management	
4.1	Change of Interface Requirement	The process for the management of interface requirement change to be addressed in this section
4.2	Verification and Validation of Interface Requirements	The approach to be adopted by the Contractor to manage verification and validation of interface requirements shall be addressed in this section
4.3	Testing and Commissioning on Interfaces	The approach to be adopted by the Contractor for the management of interface in the Testing and Commissioning stage shall be addressed in this section
4.4	Quality Procedures	Contractor’s internal quality procedures applicable for the interface management shall be listed here

5	Document Management	
5.1	Reference Documents	All applicable reference documents shall be listed in this section
5.2	Structure of Reference Documents	The structure of reference documents shall be addressed in this section
5.3	Version Control of Interface Documents	Configuration management of interface documents shall be addressed in this section
6	Communication	
6.1	Terms of Reference of Interface Meetings	The terms of reference of interface meetings shall be addressed here
6.2	Exchange of Information between Contractors	The process for the exchange of information between the pair-wise contractors (Interface Contractors) shall be stated here
6.3	Submission to Engineer	The approach to be adopted by the pair-wise contractors on the submission of the Interface Management Plan to the Engineer shall be described here
6.4	Request for Employer’s Attention	The criteria and methodology on requesting for the Employer’s attention shall be mentioned here

21. SYSTEM ASSURANCE

21.1. General

21.1.1. System Assurance Management is applicable for all stages of the E&M systems and Track works development, including design, manufacture, testing, commissioning, systems integration, trial operations, and in-service operations.

21.1.2. The Contractor shall submit a comprehensive System Assurance Management Plan (SAMP) which contains all requirements within section 4.6 of this document, for the Engineer’s review.

The System Assurance Management Plan shall cover Reliability, Availability, Maintainability and Safety, Electromagnetic Compatibility (EMC), and Fire Safety strategy.

The System Assurance Management Plan shall comprise a program showing in detail the timing of each activity and the anticipated dates for submission of system assurance documentation. The program will break down the planned activities into discrete stages of work as a minimum design, manufacturing, installation, testing and commissioning

and RAM demonstrations.

System Assurance Management Plan shall clearly identify the reviews to be performed at the end of each stage of the program. System Assurance Report shall be submitted at the end of each stage of the program which covered all the subjects above. The Subsystem Assurance Plans will be consistent in approach with the System Assurance Management Plan. The SAMP shall be certified by the Contractor’s internal department or by a third-party independent engineer from the design and manufacturing section. The SAMP shall be specifically developed for this Contract.

- 21.1.3. A Taking Over Certificate (TOC) will be issued in accordance with General and Technical specifications of the contract, when all E&M systems/subsystems, Track Works and fully integrated works have successfully completed tests and integrated testing.
- 21.1.4. A Performance Certificate will be issued by the Engineer for the total performance of the E&M systems and Track works. This Performance Certificate is required to be achieved by the end of the Defect Notification Period (DNP). Prerequisites to obtain the Performance Certificate includes: Each E&M systems and Track works asset achieves its RAM and Safety targets.
- 21.1.5. The Contractor shall provide sufficient documented information for review by the Engineer. It is expected that the design demonstration of the E&M systems and Track works performance shall be achieved through supplier-based material self-certification, including cross-references to proven and accredited in-service performance of E&M systems and Track works supplied in a similar railway application.
- 21.1.6. With regard to Safety, it is expected that certification shall be achieved through supplier-based information via application of cross-references to previously certified acceptances from a reputable body (e.g., train operators, national railways authorities, independent accredited safety bodies, etc.) of similarly supplied E&M systems and Track works equipment, with a product-generic safety case application to be made based on existing safety certification.
- 21.1.7. System Assurance shall define system assurance processes and principles by which the Contractor shall deliver an integrated railway fit for acceptance by the Employer:

System Assurance shall:

- 1) Develop requirements for safety, RAM, and EMC;
- 2) Demonstrate compliance with the Employer requirements for safety, RAM, and EMC;
- 3) Deliver the required documentation, including safety cases, safety justifications, risk assessments, risk analysis, and demonstration of compliance with safety requirements;
- 4) Support compliance to safety legislation and standards for the purpose of certification of the various components of the Project for revenue service;
- 5) Define system assurance processes and principles by which the Interface Contractors/subcontractors shall deliver an integrated railway fit for acceptance by the Employer;
- 6) Deliver a compliant RAMS/EMC environment, as demonstrated in the design

verification and validated in the integrated testing and commissioning stage of the Project. In doing so, deliver safe functionality of all equipment for operational running, assuring the safety of passengers, staff, and the public.

- 21.1.8. The Employer shall conduct audits during design, development, manufacture, and testing and commissioning phases to ensure that the Contractor has met all relevant System assurance requirements. The Engineer shall give 7 days’ notice to the Contractor about the audit arrangement. The Contractor shall provide all necessary assistance to enable the Employer or his representative to complete the audit.
- 21.1.9. The Contractor shall follow System Assurance international standards primarily IEC 62278, IEC62279, and IEC 62425 or equivalent CENELEC standards, subject to review by the Engineer.

Table 21.1: E&M systems and Track works RAM and Safety Targets

RAM / Safety Targets	
E&M systems and Track works Operational Availability to support Train service	99.95%
Passenger serious injuries	<=2 per 20 Million passengers
Staff lost Time Injury	<=2 per 200,000 Manhours worked.

21.2. System Safety Assurance Management

- 21.2.1. The Contractor shall submit a System Safety Assurance Plan, which shall contain sufficient information to demonstrate clearly the Contractor’s proposals for achieving effective and efficient safety procedures in the design, manufacture, testing, and commissioning of the Railway Systems. The System Safety Assurance Plan shall cover safety procedures and regulations to be developed and the mechanisms by which they will be implemented for ensuring safety including Hazard Analysis, Fire control, EMC/EMI control, Safety Integrity Level requirement, site safety, etc.
- 21.2.2. The Contractor shall submit a System Safety Assurance Plan according to IEC 62278 or EN 50126 (Railway Applications- Specification and Demonstration of Reliability, Availability, Maintainability, and Safety) or any other equivalent international standard for the Engineer’s review as per schedule of Table 4-1 of Appendix 4 attached hereto.
- 21.2.3. System Safety Assurance Plan shall detail, but not limited to, the following:
- (1) Organization of the Safety team.
 - (2) Management of Safety-related interfaces with other contractors.
 - (3) Provisions and procedures for providing feedback to and interacting with other disciplines in the Contractor’s team, e.g., RAM, design, maintenance, and commissioning.
 - (4) Identified Safety requirements (including interfaces).
 - (5) Planned Safety assessments/analysis to demonstrate that the system safety requirements are met by the Contractor’s design.
 - (6) Safety methods to be used for the safety analysis.

- (7) Management of subcontractors’ Safety requirements.
- (8) Safety-related software management
- (9) Quality management
- (10) Configuration management
- (11) Verification and validation of assessments, including data.
- (12) Validation of Safety requirements during manufacture, installation, commissioning, and maintenance.
- (13) Audits and Review activities.
- (14) Record keeping of Safety assessments/analysis.
- (15) Hazard Log Management.
- (16) List of deliverables, including interim items listed within this document.
- (17) High-level schedule for deliverables.

21.2.4. The Contractor shall provide the following, but not limited to:

- (1) The Hazard Analysis report shall evaluate and ensure that all the hazards are identified and satisfactorily resolved to an acceptable level.
- (2) Safety assessment report demonstrating the Safety requirements are in compliant with Technical Requirements (ERT).
- (3) The Fire Safety Analysis report shall evaluate and ensure inter alia that the fire loadings of material proposed to be used, and the fire withstand ratings, etc. are as per the requirements specified in the Employer’s Requirements – Technical Requirements (ERT).
- (4) The EMC/EMI Control Plan shall evaluate and ensure that the requirements for electromagnetic compatibility and interference according to IEC 62236 or EN 50121 and as specified in the Employer’s Requirements - Technical Requirements (ERT) all elements of the system are met.
- (5) Design Safety Case and Final Safety Case to be submitted for the Employer’s approval.

21.2.5. Electrical/electronic/programmable electrical safety-critical equipment shall be assigned a Safety Integrity Level (SIL), depending on the contribution of this equipment to safety risks also as specified in Employer’s Requirements – Technical Requirements (ERT).

For example, a Computer-based Interlocking (CBI) System shall be at SIL 4 level.

Where not specified, the Contractor shall determine SIL requirements for electrical/electronic/programmable electronic safety-critical items in accordance with EN 50126, EN 50129, or IEC 61508 standards.

21.2.6. The Contractors shall prepare a Safety-Critical Item List of equipment and LRUs classified by their impact on safety for Employer review.

21.2.7. The Contractor shall submit an Engineering Safety Validation Plan, including but not limited to:

- a) the list of safety field verifications and validations for systems/subsystems/equipment during construction, manufacturing, installation, and systems interfaces integration testing;
- b) the schedule of safety field verifications and validations;
- c) the purpose of each verification and validation;
- d) the acceptance criteria by reference to any related safety study;
- e) the recommended method of testing, including the processing of key software safety issues in verification and validation;
- f) the plan for witnessing the results of verification and validation;
- g) the recommended format of the engineering safety validation report;
- h) the submission list of the Contractor's test reports; and
- i) the recommended assessment procedure with respect to deficiencies in the verification and validation results.

21.2.8. Independent Assessment:

The Employer may appoint Independent Engineers and/or Independent Safety Assessors (ISA) to assess and advise on compliance with Contract requirements on System Assurance. The Contractor, interface contractors, subcontractors, and suppliers shall provide necessary assistance to Independent Engineers and Assessors, as required.

The independent assessment may undertake the following, but is not limited to:

- 1) Safety audits;
- 2) Safety reviews;
- 3) Design reviews;
- 4) Witnessing testing activities;
- 5) Review of the safety and quality organizational activities;
- 6) Review of the safety process; and
- 7) Assessment of hazard logs and safety cases.

21.2.9. The Contractor shall appoint their own Independent Safety Assessor for assessing safety-critical subsystems and/or safety-related software in accordance with EN 50128 and EN 50129.

Refer to APPENDIX 6 – Engineering Safety Management Plan for detailed Safety requirements.

21.3. Reliability, Availability, and Maintainability Management

21.3.1. The Contractor shall submit a RAM Plan as per IEC 62278 or EN 50126 or any other equivalent international standard for all the applicable Systems including but not limited to train control system, Rolling Stock, Signaling, PSD, Telecommunications, OCS, AFC, Power supply-system, Power distribution system, OCC, Depot Equipment and SCADA

to 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	99.958%	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

Item	System	RAM Target	
		Availability (%)	MTTR
15	Voice and Data system (mission-critical telephones)	99.95%	0.5 hours
16	Master Clock and Time distribution	99.8%	0.5 hours
17	Platform Screen Doors (PSD)	99.98%	1 hour
18	Computerized Maintenance Management System (CMMS)	95%	4 hours
19	Integrated Operations Control Center (IOCC)	99.95%	1 hour

**All the above values, may be subject to further review and revision.*

Table 21.3: PSD Performance Requirements

Sr. No.	Performance requirement – Platform Screen Doors (PSD)
1	PSD system shall have a failure rate of less than 1 in 1,000,000 operations cycle per door. (One operation cycle means one complete opening and closing cycle).
2	PSD system shall have MTTR as 60 minutes unless otherwise specified. (This time shall not include the time taken for the technician to arrive at the fault reported site).

- 21.3.7. Where appropriate, the Contractor shall also specify RAM (Reliability, Availability, and Maintainability) requirements for the design, operation, and maintenance of subsystems where the failure mode, effects, and criticality analysis (FMECA) identifies failure modes that have a maintenance, operations or safety impact, using the risk assessment methodology.
- 21.3.8. The Contractor shall conduct a Preliminary RAM Analysis which shall give an initial indication of any RAM problems which may arise which might affect the performance of the E&M Systems and Track works.
- 21.3.9. The Contractor shall adopt Reliability Block Diagram, Fault Tree Analysis, FMECA, or other appropriate methodologies to conduct RAM modelling and predict RAM performance so as to verify that the design of systems/sub-systems can achieve the Performance or RAM targets.
- 21.3.10. The Contractor shall provide RAM Demonstration Plan and RAM Demonstration report as necessary in the relevant stages of the project.
- 21.3.11. The Contractor shall provide a Reliability Critical item list which might impact the operations of the train or train service.
- 21.3.12. The Contractor shall provide all necessary references, assumptions, dependencies for the RAM data used for analysis.

The RAM evidence provided shall cover all RAM components of E&M Systems and Track works to be supplied and installed.

This shall include, but not limited to:

- (1) Availability, based on system architecture and component reliability;
- (2) Overall system availability;
- (3) Availability proof for significant components and functions demonstrated by RAM analysis (i.e., calculated failure rates, Reliability Block Diagram, failure mode analysis, etc.);
- (4) Determination of Reliability Critical item list;
- (5) Recommended preventive and corrective maintenance program;
- (6) Mean Active repair time analysis of all major modules;
- (7) Predicted holding spares requirements for the duration of the E&M Systems and Track works operational life cycles;
- (8) Lifecycle costs for ownership of the asset, i.e., capital, leasing, performance costs, part life renewal, preventive maintenance, fault and repair, spares and consumables, utilities (e.g. electric power, etc.), and decommissioning.

21.3.13. The Contractor shall supply further RAM data as requested by the Employer. The Contractor shall provide a RAM model of the final design which demonstrates the achievement of the RAM targets.

The RAM Model shall be supported by validated data from suppliers that are conforming to the corresponding sub-system RAM Targets.

21.3.14. The Contractor shall commence the use of the Data reporting analysis and corrective action system (DRACAS) prior to any factory or site acceptance tests and report to the Engineer on a regular basis.

21.3.15. During the DNP, the Operator shall collect and maintain data on the RAM performance to support the operational service availability. The Contractor shall collect RAM performance data from the Operator and submit monthly RAM Demonstration Reports to the Engineer.

21.3.16. In case the Contractor is not able to achieve the planned RAM targets, the Contractor shall take necessary corrective measures either by way of change of design of the relevant equipment/ component or software modification.

21.3.17. The Contractor shall analyze each and every failure or defect of the components of various equipment to determine the root cause of failure and to propose corrective measures, subject to review by the Engineer.

21.3.18. A record shall be maintained for each and every defect/failure in accordance with the DRACAS report to be submitted by the Contractor and reviewed by the Engineer.

21.3.19. Correction shall be made to components or subsystems that either fail to attain predicted availability levels or show Pattern Failure at the Contractor’s expense.

21.3.20. During the in-service Defects Notification Period (DNP), the E&M Systems and Track works shall demonstrate successful achievement of the RAM targets, which will be a prerequisite of the application for a Performance Certificate to be issued by the Employer.

Failure to meet the E&M Systems and Track works RAM targets within the DNP shall mean that the DNP shall be extended until such time as the RAM targets has been met.

Regardless of the above, the maximum DNP is 4 years from the date of issue of the Taking Over Certificate.

21.3.21. Availability shall be assessed by the following measure:

$$\text{Percentage Availability} = \left[1 - \frac{[\text{DT(OPM)} + \text{DT(CM)}]}{\text{Total Time}} \right] \times 100$$

Where:

- (1) Total Time, is the time in hours in the assessment period, multiplied by the number of E&M equipment commissioned under the contract;
 - a. Assessment period: Shall be no less than 6 months running during DNP;
- (2) DT(OPM), or Down Time due to Other Preventive Maintenance, is the total downtime in hours due to Preventive Maintenance other than Service checks, summed over all sessions carried out on all E&M equipment, commissioned under the contract during the assessment period;
- (3) DT(CM), or Down Time due to Corrective Maintenance, is the total downtime in hours due to Corrective Maintenance, summed over all sessions carried out on all E&M systems, and Track Works, commissioned under the contract during the assessment period. Any unreasonable delay in handing – over the E&M systems and Track Works for repairs for reasons not attributable to the Contractor shall be excluded. Time spent on E&M equipment integrity inspections after E&M systems and Track Works restorations arising from corrective maintenance work shall be included.

The contractor must provide a Maintenance Level 1 turnaround time of not more than 7 days and a Maintenance Level 2 turnaround time of not more than 30 days.

21.3.22. Maintainability Requirements: Simplicity of maintenance, operation, emergency procedures, and ease of restoration of equipment; these together with ease of access inside the equipment shall be taken into account throughout the development of the design.

The maintenance regime proposed for the E&M systems and Track Works shall be developed design stage. A Failure Mode Effect Criticality Analysis (FMECA) shall be developed to include required maintenance derived from each failure mode.

The E&M systems and Track Works shall incorporate design, which reduces maintenance, substantially improving service intervals and component replacement. The design shall also minimize Mean Time To Repair (MTTR) and costs throughout the design life.

The MTTR time measurement shall include on-site diagnostics and rectification of the

failure (including software re-boot) up to the point that the system is restored to full functionality. In the event that the failure cannot be rectified, this time measurement shall include the time necessary to remove the failed piece of equipment from the System and replace it with a functioning one.

The MTTR does not include the time taken for designated personnel to arrive on-site (access time) to begin local diagnostic activities, neither the time taken for the replacement parts to be delivered to the site.

The Contractor shall submit the expected MTTR of the identified key E&M systems and Track Works subsystems.

- 21.3.23. The E&M Systems and Track Works shall operate with minimum attention between the specified inspection periods, and shall, under the operating conditions specified, operate between overhaul periods without requiring replacement of components other than those on the agreed list of consumable parts to be proposed by the Contractor and reviewed by the Engineer.

Special tools shall be avoided wherever possible. If they are required, they shall be supplied by the Contractor in sufficient quantities to meet the maintenance requirements.

Equipment design shall be modular to minimize downtime following the failures of equipment and components. Provision for mechanical handling devices shall be provided for any single piece of equipment weighing more than 35 kg. Equipment covers shall be provided with secure, visible, latching arrangements for easy inspection.

Should the electronic equipment be found to be faulty, the equipment shall enable fault finding to be carried out at the module level. This equipment shall allow fault finding down to the smallest replaceable item of equipment.

Equipment to which access will be required for fault finding shall be conveniently located. A list of such equipment and their location shall be supplied.

The E&M Systems and Track Works shall have provision for the isolation and where applicable, earthing of all electrical sub-systems to facilitate safe and systematic maintenance and fault diagnosis.

The above-mentioned features shall be suitably reflected in the respective design documents, as applicable, during the design stage.

21.4. Electromagnetic Compatibility (EMC) Management

- 21.4.1. The contractor shall prepare an EMC Management plan and evidence of EMC assurance submissions. The plan shall show that the process to manage risks due to electromagnetic disturbance is acceptable and meets the ALARP principle.

- 21.4.2. The EMC management plan shall capture how all supplied equipment and systems are verified compliant with the requirements of the relevant standards e.g. the EN 50121. This shall include:

- (1) Appropriate tests standardized emissions and immunity conducted and radiated, continuous and transient.
- (2) Good engineering practices for installation

(3) Specific design, implementation, and integration for earthing and bonding.

21.4.3. The Contractor’s EMC submissions shall provide evidence showing that all equipment, systems, and installations have taken all necessary measures to ensure all objectives, contractual, and Employer’s design requirements with regard to EMC are fully met.

21.4.4. The EMC management should take into account the current and future EMC Environment surrounding the railway corridor.

21.5. Engineering Change Management

21.5.1. The Contractor shall manage the Configuration Control of all software changes, and notify the Engineer through the Configuration and Change Control process, of any changes to Software or Hardware baselines, including an updated Schedule of all Software/Hardware assets/fixed or moveable, installed within the Station/Tunnel/Depot Systems or Trains.

21.5.2. The Change Management process shall be included in the System Assurance Management Plan.

21.5.3. Implementing Engineering Changes to the existing agreed baseline design can often introduce, new safety risks into the existing Design. It is therefore highly important that the Engineering Change, is managed through a defined Change Management process, and that the impact upon safety risk is considered as part of the change management process.

21.5.4. The Contractor and the respective Subcontractors shall implement a robust Engineering and Configuration Change Management Process, that nominally includes the following:

(1) A systematic identification process to identify possible hazards associated with the proposed change;

(2) Performance of a Risk assessment to determine the effects of the proposed change on the overall system risk;

(3) Identification of any necessary control measures, in order to reduce the overall safety risk to ALARP;

(4) Design solution details, to include the mitigation measures into the change;

(5) Review and approval of the proposed change by the Engineer and Employer.

21.5.5. To finalize the process, the Contractor shall prepare and submit to the Engineer an Impact Assessment Report, documenting the above to describe the effects of the change on system safety. This shall include the impact on related safety assumptions and requirements, systems and subsystems design and test, documented safety evidence and deliverables, etc.

22. REQUIREMENTS MANAGEMENT

- 22.1.** The Contractor shall implement progressive assurance approach to manage & govern the project requirements in an integrated way with a complete traceability throughout the project lifecycle as per EN 50126.
- 22.2.** The Contractor shall prepare and submit to the Engineer a Requirement Management Plan within thirty (30) days of the date of the commence date. The Requirement Management Plan shall define the processes employed by the Contractor to ensure that all appropriate requirements are managed to ensure the proposed design solution meets the design requirements and demonstrated through verification and validation evidence.
- 22.3.** The Contractor shall implement “ComplyPro” as the Requirement Management software for tracking and management of requirements compliance in the project. All the costs associated with the software usage and maintenance shall be under the contractor’s own cost.
- 22.4.** The contractor shall appoint a suitably qualified and competent persons to carry out requirements management.
- 22.5.** The Contractor shall develop a database of all requirements associated with a number of definition documents defined such as but not limited to, the ERG and ERT. The Contractor will then provide evidence that the identified requirements have been managed appropriately. The database shall:
- (1) Ensure that the criteria for the purpose of verification and validation of the Requirements has been recorded with appropriate attributes assigned;
 - (2) Clearly identify requirements that have a direct impact on Safety and RAM performance.
 - (3) Hazard log management and Control measure management (Safety requirements);
 - (4) Interface register and Management;
 - (5) Ensure that compliance of the complete set of the Requirement can be demonstrated with evidence formally recorded;
 - (6) Ensure that the Requirements are consistent and traceable back to their sources, and any gap/mismatch in the Requirements are clearly identified;
 - (7) Establish formal deliverable which will support stage design reviews and the overall engineering management processes;
 - (8) Track and record Requirement changes and facilitate impact analysis on Requirement changes; and
 - (9) Track and record assumptions, if there are any, evaluating the stability of, and the impact on, the Project if any of the assumptions prove to be true or false, defining the actions necessary to make progress and monitor the assumptions, and scheduling when assumptions are to be validated and reviewed throughout the Project’s life duration.
- 22.6.** The Contractor shall issue a monthly status report showing the status of the Requirement Management and information such as the number of open and closed requirements.
- 22.7.** Each design submission shall be accompanied by a design statement and compliance matrix which describes the scope and content of each submission, its underlying assumptions, and non-conformances.

- 22.8.** The Contractor shall use the Requirements Management software “ComplyPro” as the platform to implement the DRACAS process starting from Factory Acceptance Test; continue during site Testing and Commissioning, Trial run until handover to O&M Concessionaire.
- 22.9.** Requirements Management evidence shall be presented as part of the design submission stages and at other regular stages in the manufacture, construction, implementation, installation, commissioning, and handover, as requested by the Engineer.
- 22.10.** A final output of ComplyPro shall be the demonstration of achievement of the safety requirements for the work under the Contract and shall be used to support the final safety case.
- 22.11.** The Contractor shall provide a minimum of 10 no. user licenses for the Requirements Management software “ComplyPro” to the Engineer and Employer which shall be used until the start of revenue service of the final section of the line.
- 22.12.** The Contractor shall have sufficient licenses for their own use to cover their scope of works and activities to be undertaken.

23. ASSET MANAGEMENT

- 23.1.** Asset management, work planning, work history, and asset performing reporting will be carried out using a Computerized Maintenance Management System (CMMS). The CMMS is a software-based system that will be available to the maintenance and operation organization with equipment at the Depots and OCCs.
- 23.2.** The Contractor shall produce an Asset Management Plan within ninety (90) days after the commencing of work.
- 23.3.** Plant and Material shall be designed to meet the Requirement for the specified design life in ERT.
- 23.4.** The design life of the system and components shall be considered during the project design stage.
- 23.5.** The total life cycle cost approach shall be adopted in evaluating design alternatives. System design shall be optimized with respect to the total cost of initial acquisition, operation, maintenance, system support, and disposal over the life cycle. The Contractor shall provide supporting data and technical analysis to demonstrate compliance with this requirement.
- 23.6.** An adequate supply of spare parts and test equipment shall be made available for a period of time from completion of the Works in accordance with Obsolescence Management Plan. The Contractor shall notify the Employer/Operator at least six (6) months prior to deleting any component of the supplied equipment from general availability and guarantee to provide functionally replacement units for the remainder of such specified period of time.
- 23.7.** All assets data are to be deposited and managed in the System Configuration Database Platform as part of the delivery of CMMS.
- 23.8.** The Contractor shall provide an asset register for populating the CMMS Database server. The register shall comprise, but not limited to:

- (1) Part name;
- (2) Part number;
- (3) Functional use;
- (4) System, sub-system, equipment, and component-level hierarchy for populating the CMMS Database configuration;
- (5) Maintenance requirements.
- (6) Maintenance history;
- (7) Asset Condition
- (8) The useful life of asset.
- (9) Spares stock holding;
- (10) Supplier;
- (11) Contact name and address.

23.9. The Contractor shall provide administrative schedule information for populating the CMMS database server. The schedule shall include but not limited to:

- (1) Personnel details;
- (2) Training;
- (3) Warranties;
- (4) Work schedule;
- (5) Job cards.

23.10. All warranties shall be transferred to the Employer/Operator. All spares, special tools, and equipment shall be supplied to the owner/Operator.

23.11. The Contractor shall produce an Obsolescence Management Plan for review within ninety (90) days after the commencing of work.

23.12. The plan shall consider the project related risk associated with the obsolescence issue in connection with equipment/spare parts, hardware, and software during the design. And though to its first estimated obsolescence phase.

23.13. Obsolescence shall be evaluated by the Contractor when planning the levels of spares holding.

23.14. The Contractor shall submit an Obsolescence Management Report for review at the conclusion of the final design. The report shall contain details of the management of the system and components throughout the life of each asset.

24. DEMOBILIZATION AND CLOSING WORKS

24.1. Demobilization

This section specifies the carrying out of final closeout activities in preparation for completion of all construction and installation work under the Contract; all in accordance with the Contract Documents.

24.1.1. Demobilization will be considered as complete when all of the Contractor's Equipment, materials, personnel, Temporary Facilities, construction plant or otherwise belonging to the Contractor not required for the Defect Notification Period have been removed from the project site.

24.1.2. Demobilization shall include providing required submittals prior to close-out of the Works, including but not necessarily limited to the following:

- Spare parts, tools, equipment, machinery, and rail vehicles required by the Contract,
- Operating and maintenance data as required,
- Project "As-Built Drawings" and documentation as required,
- Railway equipment as required under these specifications,
- Schedule and price of Plant installed under the contract,
- Schedule of installed works and materials, and
- Contractor's completion report and photo and video record.

24.2. Closing Works

Closing works shall be inspected by the Engineer and/or the Employer as the condition's pre-requisite to completion inspections - written notice submitted by the Contractor requesting a final or partial completion inspection.

Inspection by the Engineer and/or the Employer shall mean that the Works is substantially complete, and the Contractor has:

- Inspected and checked all the Works installed,
- Compared all the Works with the drawings, specifications, and submittals given a Notice of No Objection by the Engineer.
- Confirmed that all conditions, provisions, and requirements of Contract Documents have been fulfilled, other than any maintenance and incidental works and procedures necessary to follow,
- Clean-up operations complete,
- Temporary Facilities and utilities properly disconnected and removed, except those needed for the Defects Liability Period,
- Systems, equipment, and devices properly adjusted, serviced, tested, and fully operable,
- Materials and finishes neat, clean and undamaged; accessory parts and items securely attached,
- Broken or damaged work repaired or replaced as required,
- Spare parts delivered and stored as required,
- Recovered materials catalogued and neatly stacked for removal by the Engineer,
- Test reports and other required documentation assembled and delivered to the Engineer,
- The documents including manuals, and warranties, assembled and delivered to the Engineer, and
- Written notice of readiness for Final Completion Inspection filed with the Engineer.

24.3. Training Completion

Training will be required to be completed before the commercial operation of trains by the Contractor. Training requirements details are given in Section 14 of the General Requirements (ERG) as well as the Technical Requirements (ERT).

25. SECURITY AND INSURANCE

25.1. Security

The Contractor shall provide the following securities in accordance with the Contract requirement:

- Performance Securities; and
- Other Securities, as required under the Contract.

The detailed requirements are stipulated in the General Conditions and the Particular Conditions.

25.2. Insurance

The Contractor shall purchase and maintain the following insurances in accordance with the requirements stipulated in the General Conditions and Particular Conditions:

- Insurance for the Works (Contractor’s All Risk Insurance);
- Insurance for the Contractor’s Equipment;
- Insurance against Injury to Persons and Damage to Property (Third Party Liability Insurance);
- Cargo Insurance during Transport (Marine Cargo Insurance, Inland Transport Insurance);
- Insurance for Contractor’s Personnel (Workers’ Compensation, Employer’s Liability);
- Automobile Liability Insurance; and
- Other Insurances as may be required under the Law of the Country or agreed specifically agreed between the Employer and the Contractor.

26. PUBLICITY AND PUBLIC RELATIONS

26.1 General

The Contractor shall prepare and submit a Public Relations (PR) Plan to the Engineer. The Contractor shall also carry out PR activities and public consultation works with the instruction and guidance of the Engineer. The responsibilities of the Contractor shall, without limitation, include:

- a) Coordinate public relations matters and exercises with the Engineer and keep the Engineer informed at all times of relevant issues;

- b) Engage and liaise with relevant local Government departments, other authorities and key stakeholders to develop and coordinate public relations exercises;
- c) Establish a sense of partnership among the Government and stakeholder groups in the implementation of the Project;
- d) Promote the Project to the public and the parties concerned with a positive message and explain the benefits which will be realized by the development of the Project;
- e) Gain support and minimize objections from the community and concerned parties;
- f) Ensure adequate transparency of the Project to the public and key Stakeholders;
- g) Implement a robust process for receiving, addressing and tracking comments, criticism and complaints from all parties during the Contract;
- h) Resolve public relations issues arising during the course of construction and elevate major issues to the Employer via the Engineer, as required;
- i) Prevent and/or mitigate any nuisance or disturbance to the public due to the construction activities at the earliest possible time;
- j) Attend and answer queries for the purpose of public consultation including but not be limited to LGUs, PNR, Emergency Services, Stakeholders, Employer, related competent agencies, Non-Governmental Organizations (NGOs) or individual members of the public, local authorities and people in the affected areas, during and outside normal office hours;
- k) Prepare and supply all necessary drawings, photomontages, documents, consultation papers, presentations, display materials for public consultations; and
- l) Provide assistance and information to facilitate all Public Relations (PR) activities as per the PR Plan and as instructed by the Employer and the Engineer.

The Contractor shall nominate a qualified and experienced Public Relations Manager to manage and coordinate the required public relations responsibilities.

26.2 Public Relations Plan

The Contractor shall submit a Public Relations (PR) Plan to the Engineer within twenty eight (28) calendar days of the Commencement Date. The PR Plan shall include the methodology, specific ways and actions to be carried out for informing and consulting the public and promotion of the Project.

The PR Plan shall also include the methodology specific ways and actions to handle reactions from the public, in particular issues relating to congestion, pollution, vibration, ground movement, noise, nuisance, compensation, etc.

The PR Plan shall give proposals and details on effective liaising, consulting, informing, meeting, contacting, clarifying with the public and gaining their support and

understanding on the importance and benefits of the Project and the mitigation measures to reduce the impacts which may generate during execution of the Works.

The Contractor shall update quarterly and submit the PR Plan including a summary of PR events conducted and complaints, queries handled in the past quarter and PR events to be conducted and complaints and queries envisaged in future, throughout the Contract Period.

26.3 Public Consultation

The Contractor shall undertake public consultation works with the guidance of the Engineer, including but not be limited to, the following:

- a) Inform and consult the relevant Government departments and authorities concerning the Project, local residents, property developments, shops, schools and sensitive receivers at least two months prior to the commencement of construction works;
- b) Attend and participate in all public consultations and PR exercises;
- c) Gain support, ease concerns and minimize objections from the public affected by the construction works through public consultation;
- d) Address public concerns and feedback as far as possible to minimize disturbance to the public during construction, at the Contractor’s own expenses; and
- e) Report and give presentations to the Engineer, Employer, stakeholder agencies, NGOs and local authorities of the affected areas, etc., about the progress of the construction works and other information as requested.

The Contractor shall ensure proper communications with the public by establishing an effective communication channel. The communications shall be open and transparent in the form of an interactive two-way system. Stakeholders and parties concerned shall be updated regularly on the progress of the Works and implementation of the Project through an easily accessible system, in particular on matters relating to local traffic control arrangements, expected delays etc. Queries, feedbacks and comments from the Stakeholders and parties concerned shall be considered and handled properly in an effective manner.

An effective communication system of on-Site notices, website and phone hotlines shall be established by the Contractor.

26.4 Public Relations Tools

The Contractor shall provide and make use of, but not be limited to, the following Public Relations tools in carrying out its PR duties.

26.4.1 Website

The Contractor shall establish a website with the guidance of Engineer and Employer which gives a clear description of the Works, indication of anticipated completion date, public relations exercises, traffic control issues and details of the enquiry hotline. The

website shall be updated regularly to ensure that the information is up to date. The site shall make provision for the public and stakeholders to submit comments, feedback and complaints, which shall be addressed and responded to by the Contractor as per the PR Plan.

26.4.2 On-Site Notices

The Contractor shall post on-Site notices with the guidance of Engineer with clear description of the Works and indication of anticipated completion date together with the enquiry hotline and internet website information. Advance notices shall be given in carrying out the Works which maximize the impact on local residents.

26.4.3 Hotline

The Contractor shall set up a twenty-four (24) hour hotline with the guidance of Engineer to provide enquiry services to the public and the Contractor shall ensure queries and enquiries regarding the Works are taken seriously and dealt with swiftly. Whenever a complaint is received, response shall be made within seven (7) calendar days. If a longer processing time is needed, an interim reply shall be served to the complainant within seven (7) calendar days.

26.4.4 Construction Site Tour

The Contractor shall cooperate with and provide periodical tours of the Works to the public and stakeholders during the construction period. The main target audiences are stakeholders, ordinary families and students. Site visitors can become a means for advertising and promoting the benefit of the Project. Tours shall be planned at least once in every three months with the instruction of Engineer.

26.5 Co-ordination with Other Contractors

The Contractor shall coordinate with External Interfacing Parties and Interface Contractors in the implementation of public relations activities.

APPENDIX TO GENERAL REQUIREMENT

TABLE OF CONTENTS

Appendix 1:	General Abbreviations
Appendix 2:	Program
Appendix 3:	Monthly Progress Report
Appendix 4:	Submittals
Appendix 5:	Quality Assurance Requirements
Appendix 6:	Engineering Safety Management Plan
Appendix 7:	Outline Interface Matrices
Appendix 8:	Outline Interface Demarcation with MMSP and NSCR

APPENDIX 1- GENERAL ABBREVIATIONS

Abbreviation	Description
A0 to A6	International Document Paper Sizes
AC	Alternating Current
ANSI	American National Standards Institute
AFC	Automatic Fare Collection
AREMA	American Railway Engineering and Maintenance of Way Association
ASTM	American Society for Testing and Materials
BMS	Building Management System
BS	British Standard
CAD	Computer-Aided Design and Drafting
CAR	Corrective Action Request
CCTV	Closed Circuit Television
CDIM	Consolidated Detailed Interface Matrix
CIF	Cost, Insurance and Freight
CMMS	Computerized Maintenance Management Systems
CP	Contract Package
CP NS-02	Contract Package (Rolling Stock)
CP NS-03	Contract Package (Rolling Stock- Limited Express)
CPM	Critical Path Method
CT	Current Transformer
DC	Direct Current
DCC	Design Certificate Consent
DNP	Defect Notification Period
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DRACAS	Data reporting analysis and corrective action system
DRCA	Design Review Certificate Application
E&M	Electrical & Mechanical
EDMS	Electronic Document Management System
EIA	Environmental Impact Assessment
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EMU	Electric Multiple Unit
EN	European Norms
ER	Employer's Requirement
ERG	Employer's Requirements-General Requirements
ERT	Employer's Requirements-Technical Requirements
ETCS	European Train Control System
GC	General Conditions of Contract

Abbreviation	Description
GHG	Global Greenhouse Gas
GPS	Global Positioning System
HV	High Voltage
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronic Engineering
IP	Internet Protocol
IMP	Interface Management Plan
IOCC	Integrated Operation Control Center
ISO	International Standardization Organization
JDT	JICA Design Team
JEC	Japanese Electrotechnical Committee
JEITA	Japan Electronics and Information Technology Industry Association
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
LED	Light Emitting Diode
LV	Low Voltage
MCRP	Malolos Clark Railway Project
MCS	Material Control Schedule
MMSP	Metro Manila Subway Project
MTBF	Mean Time Between Failures
MTTR	Mean Time to Restore
NC	Normally Closed
NGCP	National Grid Corporation of the Philippines
NO	Normally Open
NSCP	National Structural Code of the Philippines
NSCR	North South Commuter Railway
NSRP-South	North South Railway Project –South Line (Commuter)
NTC	Philippine National Telecommunication Commission
O&M	Operation and Maintenance
OCC	Operation Control Center
OCS	Overhead Contact line System
ODA	Official Development Assistance
OFC	Optical Fiber Cable
OIM	Outline Interface Matrix
OJT	On the Job Training
OSR(S)	Operational Safety Report (Software)
PC	Particular Conditions of Contract
PEC	Philippines Electrical Code
PH	Philippines

Abbreviation	Description
PNFC	Philippines National Fire Code
PNR	Philippine National Railway
PR	Public Relations
PSD	Platform Screen Door
PT	Potential Transformer
RAM	Reliability, Availability, Maintainability
RAMS	Reliability, Availability, Maintainability, and Safety
RSR	Technical Regulatory Standards on Japanese Railways and including explanation
RTU	Remote Terminal Unit
SAMP	System Assurance Management Plan
SCADA	Supervisory Control and Data Acquisition
SER	Station Equipment Room
SS	Substation
STRASYA	Standard urban Railway System for Asia
SPD	Surge Protection Device
SWO	Stop Work Order
TOC	Taking Over Certificate
TSS	Traction Substation
UIC	International Union of Railway Standards
UPS	Uninterruptible Power Supply
VLAN	Virtual LAN
VT	Voltage Transformer
XLPE	Cross-linked polyethylene

APPENDIX 2- PROGRAM

2.1 Time Scaled Network/ Bar Chart

- 2.1.1 The coding structure shall be such that the activities can be summarized to the various levels. The Contractor shall comply with the Employer's Work Breakdown Structure (WBS), Activity codes, Activity ID, etc. Refer to the Tables shown in this Appendix for the detail on WBS and Activity Codes. The Contractor can propose further breakdown and additional codes for project use upon the review and approval by the Employer or the Engineer. Each activity in the network shall be coded, as a minimum, with the following:
- (1) Contract number, activity type, and unique identification numbers,
 - (2) Activity codes to indicate Unit, Segment, Stage or Phase, for e.g., design, manufacturing, delivery, installation, etc., and
 - (3) The Contractor shall note that the breakdown of the system into sub-systems is essential and shall be carried out not through further coding but activity descriptions in a consistent manner.
 - (4) For more details, the Contractor can refer to the Employer's Planning and Schedule Manual.
- 2.1.2 All logical and necessary relationships between activities shall be shown.
- 2.1.3 All key dates (if any) indicated in the Contract shall be shown. In addition to the key dates, the Contractor may require certain events that are critical to his work to be reflected in his programs as "milestones".
- 2.1.4 All the activities shall be loaded with associated costs in accordance with the Accepted Contract Amount (ACA) and Bill of Quantity (BOQ). An S-Curve should be generated accordingly to demonstrate the physical progress throughout the project period. A cashflow shall be prepared based on the forecast progress and contract terms & conditions.
- 2.1.5 If payment milestones are applicable for the contract, all the payment milestones shall be created and allocated with the agreed amount. A cashflow shall be generated accordingly.
- 2.1.6 The level of program development, information, and detail shall be sufficient to permit the Engineer to have a good appreciation of the Contractor's project management plan especially with regard to the coordination and timing of his work in relation to the work of the Interface Contractors and the obtaining of necessary approvals from the relevant local authorities. It shall demonstrate the ability to meet specified key dates through a logical work sequence that has taken account of the Project constraints.
- 2.1.7 Activities pertaining to review/acceptance by the Engineer and local authorities shall be identified. Where duration for review of the Contractor's submissions are specified elsewhere in the Contract, they shall be used.
- 2.1.8 Activities outside the scope of the Contract that may affect the Contractor's progress shall be shown.
- 2.1.9 The activity network shall be organized so that major work sections are carefully coordinated with Interface Contractors to allow opportunity for all to work with as minimal disruption as possible. Critical paths shall be identified.
- 2.1.10 Activity descriptions shall be brief and shall convey the nature and scope of the work. Uncommon abbreviations shall be explained in the legend. Float time shall be distinguished from schedule performance.

- 2.1.11 The CPM Network Diagram shall be developed to permit modification to the schedule and allows for impacts on the schedule to be analyzed by the introduction of "what if" statements into the input data.
- 2.1.12 The constraint shall be applied to only the Key Dates and Access Dates for calculating the floats. All the schedule assumptions shall be described and schedule lag shall be explained in the narrative.

2.2 Time Scaled Network/Bar Chart Details

- 2.2.1 Mobilization: The mobilization network/bar chart shall include key personnel, major team, major subcontractors, and setup of office, camp, plant & equipment, as well as the early procurement for long lead time items. In general, those activities shall be carried out within the first 120 days after the commencement of works, but not specific to the following phases.
- 2.2.2 Design: The design network/bar chart shall detail the various design, submission, and acceptance stages including approval by local authorities (if any) and Approval from the Engineer, preparation, submission, and Approval of drawings manuals and all other activities related to the design.
- 2.2.3 Manufacturing: The manufacturing network chart shall indicate the relationship and duration of the activities necessary to procure, fabricate, manufacture assemble equipment/complete car tests, ship, and deliver rolling stock in time to support the activities at the Site. It shall establish milestones for monitoring the progress of the manufacturing process. The network shall also cover activities of the Subcontractor as appropriate, including testing.
- 2.2.4 Construction and Installation: The on-site construction and installation activities shall detail the relationship and duration of the activities required for preparing, constructing, erecting, cabling all the Civil, MEP Trackwork, System works in the final location as per the drawings. The interface should be identified if multiple contractors have to carry out their works in parallel / in a specific sequence at the same site throughout a period. Certain intermediate milestones could be added to monitor and measure the key achievement.
- 2.2.5 Testing, commissioning, and acceptance: The factory and on-site testing and commissioning activities shall present the relationship and duration of those items relating to commissioning tests including those related to the Interface Contractors. The network/bar chart shall present the testing approach and sequence to be used, the deployment of resources in accordance with signaling milestone dates.
- 2.2.6 Integrated testing: The integrated testing network/bar chart shall indicate the activities required to verify the functioning of all subsystems and the rolling stock in conjunction with activities of the Interface Contractors.
- 2.2.7 Trial Runs: After completion of commissioning, the Contractor shall be required to take part in trial runs with other interface contractors as decided. The network/chart shall indicate tests, measurements, and interface tests required to be carried out to verify system performance and readiness for revenue service.

2.3 Program Standards

- 2.3.1 All the programs shall be prepared, monitored, updated, and revised based on good project planning, scheduling, and monitoring practices as accepted internationally, and under the guidance of ISO 21500 – 2012.

Table D - 1: DOTr Primavera Cloud – Schedule Work Breakdown Structure (WBS) Page 1 of 2

DOTr Primavera Cloud - Schedule Work Breakdown Structure (WBS)

Primavera Cloud - Work Breakdown Structure (WBS)																				
Structure	Level	Status	Description												Values					
Work Breakdown Structure	L01	Client defined	Contract												Predefined by DOTr					
	L02		Stage												Predefined by DOTr					
	L03		Location												As applicable (to be reviewed / approved by DOTr/GCR)					
	L04		Disciplines & Systems L1 - aligned to BOQ												Predefined by DOTr					
	L05		Disciplines & Systems L2 - aligned to BOQ												Predefined by DOTr					
	LNN	Optional	As applicable												As applicable (to be reviewed / approved by DOTr/GCR)					

Contract

Stage

Location

Disciplines & Systems

WBS

L01						L02		L03						L04		L05				
C	P	L	L	N	N	.	L	.	L	L	L	L	L	L	.	X	X	-	X	X

Table D - 2: DOTr Primavera Cloud – Schedule Work Breakdown Structure (WBS) Page 2 of 2

DOTr Primavera Cloud - Schedule Work Breakdown Structure (WBS)

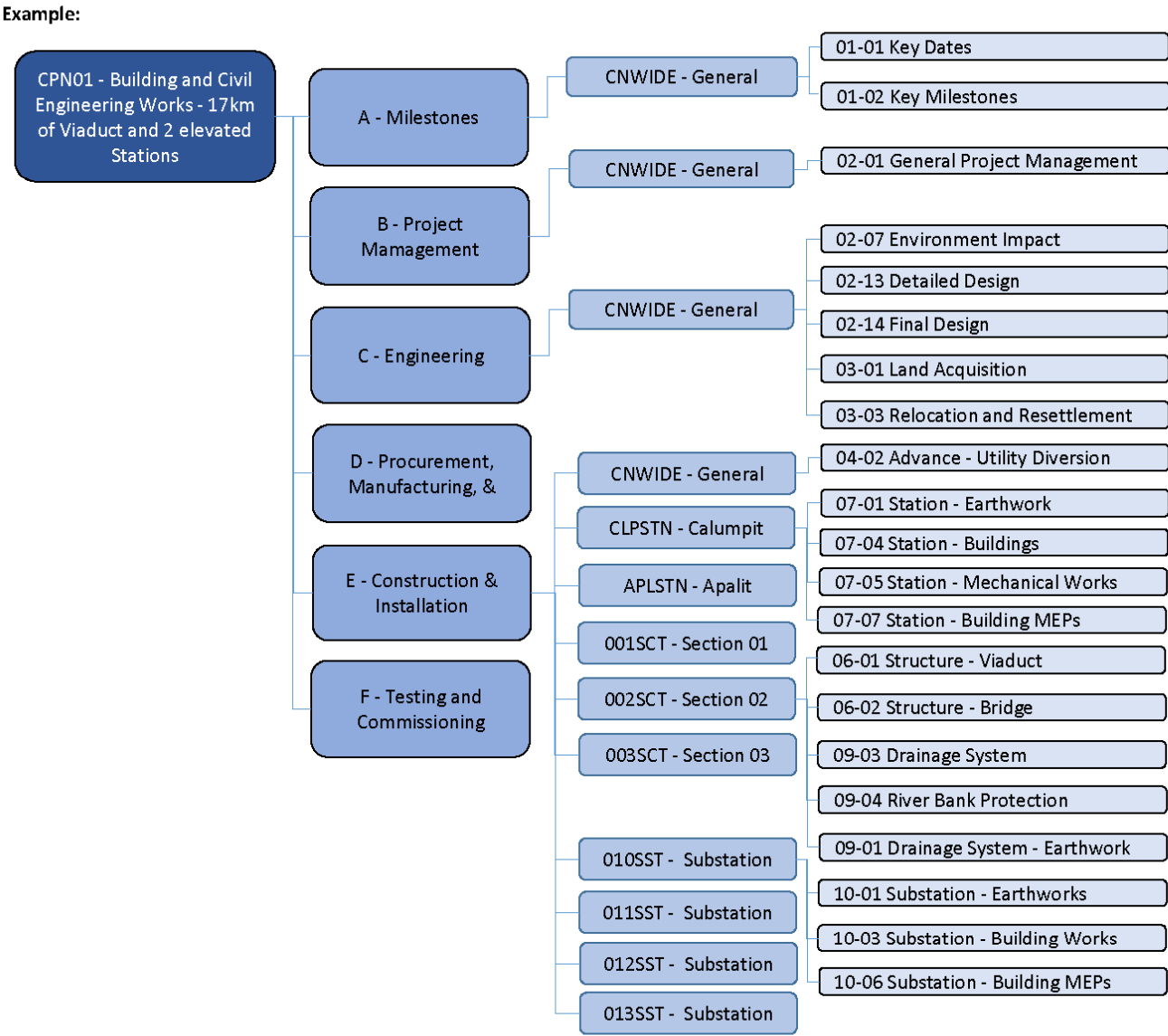


Table D - 3: DOTr Primavera Cloud – Schedule WBS Dictionary Page 1 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

Work Breakdown Structure (WBS) Dictionary (Level 1 to Level 5)

WBS Level 1 - Contract						
C	P	L	L	N	N	Description
C	P		O	O	1	Building and Civil Engineering Works
C	P		O	O	2	Building and Civil Engineering Works
C	P		O	O	3	Rolling Stock - Commuter Trainsets
C	P		O	O	4	E&M Systems and Track Works
C	P		O	O	5	Building and Civil Engineering Works
C	P		N	O	1	Building and Civil Engineering Works - 17km of Viaduct and 2 elevated Stations
C	P		N	O	2	Building and Civil Engineering Works - 16km of Viaduct and 1 elevated Stations
C	P		N	O	3	Building and Civil Engineering Works - 16km of Viaduct and 2 elevated Stations
C	P		N	O	4	Building and Civil Engineering Works - 6.5km of mainline and 1.1km depot access line, 1 U
C	P		N	O	5	Building and Civil Engineering Works - Depot (approx. 33ha)
C	P		S	O	1	Building and Civil Engineering Works - 1.1 km of Viaduct and 1 Elevated Station
C	P		S	O	2	Building and Civil Engineering Works - 7.9 km of Viaduct and 3 Elevated Station
C	P		S	3	a	Building and Civil Engineering Works - 4.5 km of Viaduct, Atgrade, 1 atgrade Station and 1
C	P		S	3	b	Building and Civil Engineering Works - 10.7 km of Viaduct, Atgrade, 1 semi U/G, 1 atgrade
C	P		S	O	4	Building and Civil Engineering Works - 8.5 km of Viaduct and 2 Elevated Station
C	P		S	O	5	Building and Civil Engineering Works - 12.8 km of Viaduct and 3 Elevated Stations
C	P		S	O	6	Building and Civil Engineering Works - 10.3 km of Viaduct and 3 Elevated Stations
C	P		S	O	7	Building and Civil Engineering Works - Depot (Approx. 20ha)
C	P	N	S	O	1	E&M Systems and Track Works including PSD at all NSCR stations
C	P	N	S	O	2	Rolling Stock-Commuter Trainsets (38 trainsets consisting of 8 cars, total 304 cars)
C	P	N	S	O	3	Rolling Stock-Limited Express Trainsets (7 trainsets consisting of 8 cars, total 56 cars)
To be added when new contract is initiated						
WBS Level 2 - Stage (EPC/D&B phases)						
					L	Description
					A	Milestones
					B	Project Management
					C	Engineering (Concept, Preliminary, Detailed, Final, ICD, NOC etc)
					D	Contract & Procurement (including manufacturing & delivery)
					E	Construction & Installation

Remarks

Remarks

Table D - 4: DOTr Primavera Cloud – Schedule WBS Dictionary Page 2 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C P L L N N						Description	Remarks
					F	Testing & Commissioning (static, interface, dynamic, integration, Trial Operation)	
					G	Operation & Maintenance	
WBS Level 3 - Location / Section / Construction Front							
L L L L L L						Description	Remarks
						Pre-defined by DOTr	
P	R	W	I	D	E	Program Wide	
N	1	W	I	D	E	N1 Wide	
N	2	W	I	D	E	N2 Wide	
S	C	W	I	D	E	SC Wide	
C	N	W	I	D	E	General (Contract Wide)	
A	L	A	S	T	N	Station - Alabang	
A	N	G	S	T	N	Station - Angeles	
A	P	L	S	T	N	Station - Apalit	
B	A	L	S	T	N	Station - Balagtas	
B	A	N	S	T	N	Station - Banlic	
B	C	T	S	T	N	Station - Bicutan	
B	I	N	S	T	N	Station - Binan	
B	L	U	S	T	N	Station - Blumentritt	
B	O	C	S	T	N	Station - Bocaue	
B	C	L	S	T	N	Station - Bucal	
B	U	E	S	T	N	Station - Buendia	
C	B	Y	S	T	N	Station - Cabuyao	
C	M	B	S	T	N	Station - Calamba	
C	A	L	S	T	N	Station - Caloocan	
C	L	P	S	T	N	Station - Calumpit	
C	R	K	S	T	N	Station - Clark	
C	I	A	S	T	N	Station - Clark International Airport	
E	D	S	S	T	N	Station - EDSA	
E	S	P	S	T	N	Station - Espana	
F	T	I	S	T	N	Station - FTI	
G	U	I	S	T	N	Station - Guiguinto	
M	A	B	S	T	N	Station - Mabalacat	
M	L	B	S	T	N	Station - Malabon	
M	A	L	S	T	N	Station - Malolos	
M	L	S	S	T	N	Station - Malolos South	
M	A	R	S	T	N	Station - Marilao	
M	E	Y	S	T	N	Station - Meycauayan	
M	T	N	S	T	N	Station - Muntinlupa	
N	C	1	S	T	N	Station - New Clark City 1	
N	C	2	S	T	N	Station - New Clark City 2	

DOTr Primavera Cloud - Schedule WBS Dictionary

Page 3 of 7

Table D - 6: DOTr Primavera Cloud – Schedule WBS Dictionary Page 4 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	N	N	Description	Remarks
	N	N	-	N	Description	Remarks
0	1				Project Key Dates & Milestones	
0	1	-	0	1	Key Dates	
0	1	-	0	2	Key Milestones	
0	1	-	0	3	Payment Milestones	
0	1	-	0	4	Other Milestones (Interface/Intermediate/not defined in the contract)	
0	2				General and Consultancy Services	
0	2	-	0	1	General Project Management (General Requirements)	Level 5 is aligned to General Requirement in BOQ
0	2	-	0	2	Data Collection & Concept Design	Level 6
0	2	-	0	3	Geotechnical	Suggest to be aligned to the further breakdown (As per GS No.) in BOQ
0	2	-	0	4	Land Based Survey	GS No. Description - some examples below
0	2	-	0	5	Aerial Survey	103 Possession of Site and Contractors Mobilization
0	2	-	0	6	Business Modeling	104 Contractor's Temporary Facilities
0	2	-	0	7	Environment Impact Assessment	105 Project Information Sign Boards
0	2	-	0	8	Material Testing	106 Laboratory
0	2	-	0	9	Interface coordination and management	107 Contractor's Project Organization and Management
0	2	-	1	0	Specialist Design Consultancies	108 Site Office for the Employer and the Engineer
0	2	-	1	1	Safety, Risk, Security, RAMS Services	110 Detailed Works Programme
0	2	-	1	2	Preliminary Engineering	112 Surveying, Setting out of the Works and Staking
0	2	-	1	3	Detailed Design and Engineering	114 Traffic Management
0	2	-	1	4	Final Design and Shop Drawings	118 Environmental Management
0	2	-	1	5	Legal Services	119 Document and Drawing Submittals and Reviews
0	2	-	1	6	Meteorology & Seismology (incl Weather & Climate) Services	120 Submission and Response Procedure
0	3				RAP (Resettlement Action Plan)	121 Operating and Maintenance Manuals and Documents
0	3	-	0	1	Land Acquisition (Paper works for utility relocation and tree permits)	122 Construction Photographs
0	3	-	0	2	LRIP (Likelihood Restoration and Improvement Program)	123 Video Recordings
0	3	-	0	3	Relocation and Resettlement (proeject affected people)	130 Securities and Insurance
0	3	-	0	4	GRM (Grievances Redress Mechanism)	
0	4				Advance & Enabling Works	
0	4	-	0	1	Demolition	
0	4	-	0	2	Utility Diversion (or Protection)	
0	4	-	0	3	Relocation of Existing Facilities	
0	5				Earthworks	
0	5	-	0	1	Earthworks	
0	5	-	0	2	Maintenance Road/Access Road	
0	5	-	0	3	Existing Road Realignment	
0	5	-	0	4	Swampy Section	
0	5	-	0	5	Subbase and Base Course	
0	5	-	0	6	Surface Course	

refer to N-01 to N-05 BOQ

Table D - 7: DOTr Primavera Cloud – Schedule WBS Dictionary Page 5 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
	0	5	-	0	7	Structural Works	
	0	5	-	0	8	Miscellaneous Structures	
	0	5	-	0	9	Plumbing and Sanitary Works	
	0	6				Railway Structures	Level 6
	0	6	-	0	1	Viaduct	Suggest to be aligned to the further breakdown in BOQ
	0	6	-	0	2	Bridges (Underbridge, Overbridge, etc)	Earthwork
	0	6	-	0	3	Underground Structures (Cut & Cover Tunnel, Bored Tunnel, Underpass etc)	Sub Structural and Superstructural Works
	0	6	-	0	4	At Grade Structure	Drainage Works (In Viaduct)
	0	6	-	0	5	Utility Corridor	Miscellaneous Works
	0	6	-	0	6	Box Culvert	
	0	7				Stations (including SIG/COM/Railway Electric house)	Level 6
	0	7	-	0	1	Earthworks	Suggest to be aligned to the further breakdown in BOQ
	0	7	-	0	2	Subbase and Base Course	
	0	7	-	0	3	Surface Course	
	0	7	-	0	4	Building Works	
	0	7	-	0	5	Mechanical Works	
	0	7	-	0	6	Miscellaneous Works	
	0	7	-	0	7	Building MEPs	
	0	7	-	0	8	Exterior Works / Related Facilities	
	0	8				Depots	Level 6
	0	8	-	0	1	Major Buildings (OCC, WS & LRS)	Suggest to be aligned to each building in BOQ
	0	8	-	0	2	Small Buildings	Level 7
	0	8	-	0	3	Training Center	Suggest to be aligned to the further breakdown in BOQ
	0	8	-	0	4	Landscape	
	0	9				Drainage System & River Bank Protection	
	0	9	-	0	1	Earthworks	
	0	9	-	0	2	Structural Works	
	0	9	-	0	3	Drainage Works	
	0	9	-	0	4	River Bank Protection Works	
	0	9	-	0	5	SAPANG BALEN River Plan (N-03)	
	0	9	-	0	6	Pump System for Underground and Gil Puyat Underpass (N-04)	
	0	9	-	0	7	Drain System for Detention Basin 1 & 2 (N-05)	
	1	0				Substations	
	1	0	-	0	1	Earthworks	
	1	0	-	0	2	Subbase and Base Course	
	1	0	-	0	3	Building Works	
	1	0	-	0	4	Mechanical Works	
	1	0	-	0	5	Miscellaneous Works	

Table D - 8: DOTr Primavera Cloud – Schedule WBS Dictionary Page 6 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
	1	0	-	0	6	Building MEPs	
	1	0	-	0	7	Exterior Works / Related Facilities	
	1	1				Trackwork	
	1	1	-	0	1	Plain Line Track (Slab, ballast, etc)	
	1	1	-	0	2	Switches & Crossing	
	1	2				Railway Systems	
	1	2	-	0	1	Signal and Train Control System	NS01, NS02, NS03 are based on Payment Milestones (very high level in BOQ. to be subdivided by contractors)
	1	2	-	0	2	Telecommunications System	
	1	2	-	0	3	Power Supply System	
	1	2	-	0	4	Power Distribution System	
	1	2	-	0	5	Overhead Catenary System (Overhead Contact line)	
	1	2	-	0	6	SCADA	
	1	2	-	0	7	Operation Control Center (OCC) System	
	1	2	-	0	8	Platform Screen Door System	
	1	2	-	0	9	Automatic Fare Collection System	
	1	2	-	1	0	Depot Equipments (Facility)	
	1	2	-	1	1	Training Facilities	
	1	2	-	1	2	Fire System	
	1	2	-	1	3	Asset Protection System	
	1	2	-	1	4	Maintenance Management Information System	
	1	2	-	1	5	Building Management System	
	1	3				Client Procured Materials	
	1	3	-	0	1	Rail	
	1	3	-	0	2	Ballast	
	1	3	-	0	3	Sleepers	
	1	3	-	0	4	Fasteners	
	1	3	-	0	5	Switches & Crossings	
	1	4				Rolling Stock & Maintenance Vehicles	
	1	4	-	0	1	Passenger Trainsets - Commuter	
	1	4	-	0	2	Passenger Trainsets - Limited Express	
	1	4	-	0	3	Maintenance Vehicles	
	1	4	-	0	4	Freight Trainsets	
	1	5				T&C and Handover	
	1	5	-	0	1	Testing & Commissioning (Static Test, Dynamic Tests, Integration Test, SODT)	
	1	5	-	0	2	Training	
	1	5	-	0	3	Final Documentation (as built drawing, manuals, etc)	
	1	5	-	0	4	Spare Parts/Special Tools	

Table D - 9: DOTr Primavera Cloud – Schedule WBS Dictionary Page 7 of 7

DOTr Primavera Cloud - Schedule WBS Dictionary

C	P	L	L	N	N	Description	Remarks
1	6					Operation Readiness & Trial Run	
1	6	-	0	1		Early Phase (Policies, Plans, mobilization)	
1	6	-	0	2		O&M Management & Support Services (Management systms & tools, IT, procurement, D&B documentation, OHSSE, stakeholders management, PMO, etc)	
1	6	-	0	3		Deployment phase (Procedures and rule books, recruiting & training, fitout, etc)	
1	6	-	0	4		Trial Run & Certification	
1	7					Provisional Sum / Dayworks	

Table D - 10: Activity Codes Page 1 of 1

Activity Code			
DOTr NSCR - P6 Activity Code			
DOTr01 - Project Group		DOTr05 - Subsystem/SubGroup	
Code Value	Description	Code Value	Description
PW	Project Wide	001	Project/Contract Wide
N1	NSCR (Metro Manila to Malolos)	002	Professional and Technical Services
N2	MCRP (Malolos to Clark International Airport)	003	Resettlement Action Plan related
SC	NSRP - South (Metro Manila to Calamba)	004	AD-Demolition
DOTr02 - Sub-Phase		005	AD-Utility Diversion (or Protection)
Code Value	Description	006	AD-Relocation of Existing Facilities
KD	Key Date	007	EW-Earthworks
AD	Access Dates	008	EW-Maintenance Road/Access Road
KM	Key Milestones	009	EW-Existing Road Realignment
IM	Interface Milestones	010	EW-Swampy Section
MB	Mobilization (Staff/Office/Camp/Facility)	011	EW-Subbase and Base Course
PP	Management Plan and Procedures	012	EW-Surface Course
MR	Meetings and Reporting	013	EW-Structural Works
PM	Other Project Management	014	EW-Miscellaneous Structures
LA	Land Acquisition (RAP) related	015	EW-Plumbing and Sanitary Works
SV	Survey & Study (data collection)	016	STR-Viaduct
CD	Concept Design / System Design	017	STR-Bridges (Underbridge, Overbridge, etc)
PD	Preliminary Design / FEED	018	STR-Underground Structures (Cut & Cover Tunnel, Bored Tunnel, Underpass etc)
DD	Detail Design	019	STR-At Grade Structure
FD	Final Design (Shop Drawings)	020	STR-Utility Corridor
SW	Software Design & Development	021	STR-Box Culvert
IC	Interface Coordination Drawings	022	STN-Earthworks
PR	Procurement	023	STN-Subbase and Base Course
MF	Manufacturing & Fabrication (including TT, FAI, FAT)	024	STN-Surface Course
TD	Delivery to Site (Overseas & Domestic)	025	STN-Building Works
TE	Construction Temporary facilities	026	STN-Mechanical Works
AW	Advance works / Enabling works	027	STN-Miscellaneous Works
YN	Construction Installation	028	STN-Building MEPs
PI	Post Installation Check-out Test	029	STN-Exterior Works / Related Facilities
ST	Static Test	030	DPT-Major Buildings (OCC, WS & LRS)
DY	Dynamic Test	031	DPT-Small Buildings
SI	System Integrated Test	032	DPT-Training Center
TO	Trial Operation, Trial Running	033	DPT-Landscape
CA	Certification & Authority Approval	034	DSRB-Earthworks
TR	Training (including plans and manuals)	035	DSRB-Structural Works
OM	O&M related (Operation Readiness)	036	DSRB-Drainage Works
HO	Handover - Documentation/Spare parts/Special tools	037	DSRB-River Bank Protection Works
DM	Demobilization / Site Rehabilitation	038	DSRB-SAPANG BALEN River Plan (N-03)
DOTr03 - Responsibility		039	DSRB-Pump System for Underground and Gil Puyat Underpass (N-04)
Code Value	Description	040	DSRB-Drain System for Detention Basin 1 & 2 (N-05)
DOT	DOTr	041	SST-Earthworks
NST	NSTren	042	SST-Subbase and Base Course
ARP	Arup	043	SST-Building Works
GCR	GCR	044	SST-Mechanical Works
CON	Contractors	045	SST-Miscellaneous Works
PNR	PNR	046	SST-Building MEPs
NHA	NHA	047	SST-Exterior Works / Related Facilities
SFH	SFHC	048	TW-Plain Line Track (Slab, ballast, etc)
DOTr04 - Land Acquisition (Specific)		049	TW-Switches & Crossing
Code Value	Description	050	SYS-Signal and Train Control System
FSS	Feasibility Study Surveys	051	SYS-Telecommunications System
DDS	DED Surveys	052	SYS-Power Supply System
LSV	Land and Structure Validation	053	SYS-Power Distribution System
NOT	Notice of Taking	054	SYS-Overhead Catenary System (Overhead Contact line)
APP	Appraisal	055	SYS-SCADA
OTB	Offer to Buy	056	SYS-Operation Control Center (OCC) System
EXP	Expropriation	057	SYS-Platform Screen Door System
PYP	Payment Processing	058	SYS-Automatic Fare Collection System
TOT	Transfer of Title	059	SYS-Depot Equipments (Facility)
PTE	Permit to Enter	060	SYS-Training Facilities
TCU	DENR Tree Cutting	061	SYS-Fire System
PCL	PROW Clearing (PAPs' structures)	062	SYS-Asset Protection System
NA	Not Applicable	063	SYS-Maintenance Management Information System
		064	SYS-Building Management System
		065	PRC-Rail
Code Value	Description	Code Value	Description
066	PRC-Ballast	STN042	Station - Surat
067	PRC-Sleepers	STN043	Station - Tabing Ilog
068	PRC-Fasteners	STN044	Station - Tuktukan
069	PRC-Switches & Crossings	STN045	Station - Tutuban
070	RS-Passenger Trainsets - Commuter	STN046	Station - Valenzuela
071	RS-Passenger Trainsets - Limited Express	STN047	Station - Valenzuela Polo
072	RS-Maintenance Vehicles	SSTN01	Substation - N1-01
073	RS-Freight Trainsets	SSTN02	Substation - N1-02
074	HO-Testing & Commissioning (Static Test, Dynamic Tests, Integration Test, SODT)	SSTN03	Substation - N1-03
075	HO-Training	SSTN04	Substation - N1-04
076	HO-Final Documentation (as built drawing, manuals, etc)	SSTN05	Substation - N1-05
077	HO-Spare Parts/Special Tools	SSTN06	Substation - N1-06
078	OPR-Early Phase (Policies, Plans, mobilization)	SSTN07	Substation - N1-07
079	OPR-O&M Management & Support Services (Management systms & tools, IT, procurement, D&B documentation, OHSSE, stakeholders management, PMO, etc)	SSTN08	Substation - N1-08
080	OPR-Deployment phase (Procedures and rule books, recruiting & training, fitout, etc)	SSTN09	Substation - N1-09
081	OPR-Trial Run & Certification	SSTN10	Substation - N2-10
082	Provisional (others)	SSTN11	Substation - N2-11
DOTr06 - Sub-Location		SSTN12	Substation - N2-12
Code Value	Description	SSTN13	Substation - N2-13
PRW000	Project/Contract Wide	SSTN14	Substation - N2-14
STN001	Station - Alabang	SSTN15	Substation - N2-15
STN002	Station - Angeles	SSTN16	Substation - N2-16
STN003	Station - Apalit	SSTN17	Substation - N2-17
STN004	Station - Balagtas	SSTN18	Substation - N2-18
STN005	Station - Banlic	SSTN19	Substation - N2-19
STN006	Station - Bicutan	SSTN20	Substation - N2-20
STN007	Station - Binan	SSTN21	Substation - N2-21
STN008	Station - Blumentritt	SSTN22	Substation - N2-22
STN009	Station - Bocaue	SSTS01	Substation - S-01
STN010	Station - Bucal	SSTS02	Substation - S-02
STN011	Station - Buendia	SSTS03	Substation - S-03
STN012	Station - Cabuyao	SSTS04	Substation - S-04
STN013	Station - Calamba	SSTS05	Substation - S-05
STN014	Station - Caloocan	SSTS06	Substation - S-06
STN015	Station - Calumpit	SSTS07	Substation - S-07
STN016	Station - Clark	SSTS08	Substation - S-08
STN017	Station - Clark International Airport	SSTS09	Substation - S-09
STN018	Station - EDSA	SSTS10	Substation - S-10
STN019	Station - Espana	SSTS11	Substation - S-11
STN020	Station - FTI	SSTS12	Substation - S-12
STN021	Station - Guiguinto	SSTS13	Substation - S-13
STN022	Station - Mabalacat	SSTS14	Substation - S-14
STN023	Station - Malabon	SSTS15	Substation - S-15
STN024	Station - Malolos	SSTS16	Substation - S-16
STN025	Station - Malolos South	SSTS17	Substation - S-17
STN026	Station - Marilao	SSTS18	Substation - S-18
STN027	Station - Meycauayan	SSTD01	Substation - N1 Depot
STN028	Station - Muntinlupa	SSTD02	Substation - N2 CIA Depot
STN029	Station - New Clark City 1	SSTD03	Substation - SC Banlic Depot
STN030	Station - New Clark City 2	DPT001	Depot - Calamba
STN031	Station - New Clark City 3	DPT002	Depot - Clark
STN032	Station - Nichols	DPT003	Depot - Malanday, Valenzuela
STN033	Station - Pacita		
STN034	Station - Paco		
STN035	Station - San Fernando		
STN036	Station - San Pedro		
STN037	Station - Santa Mesa		
STN038	Station - Santa Rosa		
STN039	Station - Santo Tomas		
STN040	Station - Sindalan		
STN041	Station - Soils		

Table D - 11: DOTr Primavera – Schedule Activity ID Numbering System Page 1 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

Activity ID : ACTIVITY ID NUMBERING SYSTEM

Following section is extracted from Planning and Schedule Manual

All Project Schedules are developed by using Primavera P6 software. It defines each Design, Manufacturing, Installation and Testing activity for different sections and stages. It also establishes the sequence and logic between the activities. This section will explain the principles for Activity ID Numbering System.

In Primavera P6, it is allowed to have 20 digits for Activity ID. However, it is not easy to remember or recognize if the Activity ID is too long and complicate. Therefore, we consider using only 13 digits for Activity ID and group them into 4 blocks. The details of the 4 blocks coding structures will be explained as below:

Block 1	Block 2	Block 3	Block 4
OBS / Contract	PBS Code	ABS Code	ID Number
LLNN	LLL	LL	NNNN

Block 1 contains first to forth digit of the Activity ID and they represent OBS Code (Contract Number). Excluding first 2 letters (CP) of contract number, it comprises rest two letters (LL) and two numbers (NN).

Block 1
OBS / Contract
LLNN

Contract Number	SUBP Description
N01	Building and Civil Engineering Works - 17km of Viaduct and 2 elevated Stations
N02	Building and Civil Engineering Works - 16km of Viaduct and 1 elevated Stations
N03	Building and Civil Engineering Works - 16km of Viaduct and 2 elevated Stations
N04	Building and Civil Engineering Works - 6.5km of mainline and 1.1km depot access line, 1 U/G Stations
N05	Building and Civil Engineering Works - Depot (approx. 33ha)
S01	Building and Civil Engineering Works - 1.1 km of Viaduct and 1 Elevated Station
S02	Building and Civil Engineering Works - 7.9 km of Viaduct and 3 Elevated Station
S3a	Building and Civil Engineering Works - 4.5 km of Viaduct, Atgrade, 1 atgrade Station and 1 Elevated Station
S3b	Building and Civil Engineering Works - 10.7 km of Viaduct, Atgrade, 1 semi U/G, 1 atgrade, and 2 Elevated Stations
S04	Building and Civil Engineering Works - 8.5 km of Viaduct and 2 Elevated Station
S05	Building and Civil Engineering Works - 12.8 km of Viaduct and 3 Elevated Stations
S06	Building and Civil Engineering Works - 10.3 km of Viaduct and 3 Elevated Stations
S07	Building and Civil Engineering Works - Depot (Approx. 20ha)
NS01	E&M Systems and Track Works including PSD at all NSCR stations
NS02	Rolling Stock-Commuter Trainsets (38 trainsets consisting of 8 cars, total 304 cars)

Block 2 contains the fifth to seventh digit of the Activity ID and they represent Product Breakdown Structure code (PBS). In principle, it should align to client's WBS Level 4. However, with discussion and approval from the Client/GCR, it could be further broken down and added with new items as per scope of work.

Block 2
PBS Code
LLL

Subgroup	Description
GEN	General and Consultancy Services
RAP	RAP (Resettlement Action Plan)
ADW	Advance & Enabling Works
EWS	Earthworks
STR	Railway Structures
STN	Stations (including SIG/COM/Railway Electric house)
DPT	Depots
DRB	Drainage System & River Bank Protection

Table D - 12: DOTr Primavera Cloud – Schedule Activity ID Numbering System Page 2 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

SST	Substations
TWK	Trackwork
SYS	Railway Systems
PRC	Client Procured Materials
RSV	Rolling Stock & Maintenance Vehicles
THO	T&C and Handover
OPR	Operation Readiness & Trial Run
PRS	Provisional Sum / Dayworks

Block 3 contains the eighth and ninth digit of the Activity ID and they represent Activity Breakdown Structure code (ABS). It consists of 2 letters (LL). Their details are listed below:

Block 3
ABS Code
LL

ABS	ABS Description
KD	Key Date
AD	Access Dates
KM	Key Milestones
IM	Interface Milestones
MB	Mobilization (Staff/Office/Camp/Facility)
PP	Management Plan and Procedures
MR	Meetings and Reporting
PM	Other Project Management
LA	Land Acquisition (RAP) related
SV	Survey & Study (data collection)
CD	Concept Design / System Design
PD	Preliminary Design / FEED
DD	Detail Design
FD	Final Design (Shop Drawings)
SW	Software Design & Development
IC	Interface Coordination Drawings
PR	Procurement
MF	Manufacturing & Fabrication (including TT, FAI, FAT)
TD	Delivery to Site (Overseas & Domestic)
TE	Construction Temporary facilities
AW	Advance works / Enabling works
YN	Construction Installation
PI	Post Installation Check-out Test
ST	Static Test
DY	Dynamic Test
SI	System Integrated Test
TO	Trial Operation, Trial Running
CA	Certification & Authority Approval
TR	Training (including plans and manuals)
OM	O&M related (Operation Readiness)
HO	Handover - Documentation/Spare parts/Special tools
DM	Demobilization / Site Rehabilitation

Block 4 contains the tenth to thirteenth digit of the Activity ID and they represent the ID number ranging from 0000 to 9999.

Table D - 13: DOTr Primavera Cloud – Schedule Activity ID Numbering System Page 3 of 3

DOTr Primavera Cloud - Schedule Activity ID Numbering System

Block 4	
ID Number	
NNNN	

ID No.	ID No. Description
0	ID No. 0000
.....
9999	ID No. 9999

APPENDIX 3 - MONTHLY PROGRESS REPORTS

3.1 Submission

- 3.1.1 The Contractor shall submit to the Engineer, a Monthly Progress Report within 7 days after the last day of the period to which it relates. It shall be submitted in a format to which the Engineer shall have given his consent and shall contain sections/sub-sections for, but not be limited to, the topics listed below.

3.2 Financial Status

- 3.1.1 A summary sheet and narrative review of all significant financial matters, and actions proposed or taken with respect to any outstanding matters.
- 3.1.2 A spreadsheet summarizing each Cost Center, the budget, costs incurred during the period, costs to date, costs to go, cost forecast (total of costs to date and costs to go), and cost variance (difference between cost forecast and budget).
- 3.1.3 A spreadsheet indicating the status of all payments due and made.
- 3.1.4 List of Variations.
- 3.1.5 List of notice given under [Employer’s Claims and notices] given under [Contractor’s Claims] of the GC.
- 3.1.6 A report on the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.

3.2 Progress

- 3.2.1 Chart and detailed descriptions of progress, including each stage of design, Contractor’s documents, procurement, manufacture, delivery to site, installation, assembling, testing, commissioning, and trial operation.
- 3.2.2 Comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.
- 3.2.3 A simplified representation of progress is measured in percentage terms compared with percentage planned as derived from the Works Program.
- 3.2.4 Three Month Rolling Program, Time Chainage Program, and any other programs required by the Engineer.
- 3.2.5 Photographs and videos showing the status of manufacture and progress on the site.

3.3 Quality Assurance Reporting

- 3.4.1 Summarized report of quality assurance documents, test results, and certificates of materials. Two copies of these documents shall be submitted as a part of Quality Assurance reporting.

3.4 Milestones Status

- 3.4.1 A report on the status of all Milestones Items due to have been achieved during the month and forecasts of achievement of any missed Milestones, and those due in the next month.

3.5 Planning and Coordination

- 3.5.1 A summary of all planning/co-ordination activities during the month and details of outstanding actions.
- 3.5.2 A schedule of all submissions and consents/approvals obtained/outstanding.

3.6 Manufacturing progress reporting

- 3.6.1 Detailed description of all manufacturing achievements in the month including any problems encountered.
- 3.6.2 Material Control Schedule.
- 3.6.3 Summary of inspections and audits planned in the coming three months.
- 3.6.4 Summary of all issues raised during the inspections and audits that require closure.
- 3.6.5 For the manufacture of each main item of the Plant or component thereof, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (1) Commencement of manufacture,
 - (2) Contractor's inspection,
 - (3) Tests, and
 - (4) Shipment and arrival at the Site.

The percentage progress shall be in the form of actual v's planned performance in respect of major equipment as required by the Engineer.

3.7 Contractor's Personnel and Equipment and Employer's Equipment

- 3.7.1 Detail description of Records of Contractor's Personnel and Equipment engaged.

3.8 Safety

- 3.8.1 Safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations and actions, proposed to prevent further occurrence.

3.9 Environment

- 3.9.1 A review of all the environmental issues during the past month to include all monitoring reports, mitigation measures undertaken, and activities to control environmental impacts.

3.10 Risk Management

- 3.10.1 A risk report shall be included within the Monthly Progress Report. The risk report shall describe the top five risks and issues, and risk management activities for the month. An appendix to the report shall include the contractors risk register printed from the Active Risk Manager (ARM), project risk database (listing all of the identified risks and issues) to be implemented by the Contractor, together with the risk detail sheet for each of the top five risks and issues.

3.11 Gender and Development

- 3.11.1 A summary of all recording, monitoring, investigation, and mitigation of all gender-based violence and sexual harassment-related cases committed by the Contractor's and Sub-Contractors' personnel to persons on and near the site.

APPENDIX 4 - SUBMITTALS REQUIRED

4.1. Submittals:

4.1.1. In accordance with the Employer’s Requirement-General Requirement, the Contractor shall submit, but not be limited to, the following plans within the time specified in the following Table.

Table 4-1: Submission of Plans

No.	Plan	To be submitted within	Sub-Section
1	Project Management Plan	15 days after the Commencement Date	4.2.2
2	Interface Management Plan	28 days after the Commencement Date	4.3.3
3	System Interface Plan	28 days after the Commencement Date	4.4.1
4	Detailed Time Program	28 days after the Commencement Date	4.5.2
5	Quality Assurance Management Plan	45 days after the Commencement Date	4.6.4
6	System Assurance Management Plan	45 days after the Commencement Date	4.7.1
7	System Safety Assurance Plan	45 days after the Commencement Date	20.2.1
8	Reliability, Availability and Maintainability Management Plan	90 days after the Commencement Date	20.3.1
9	Site Safety Management Plan	28 days after the Commencement Date	4.8.4
10	Software Quality Assurance Management Plan	90 days after the Commencement Date	4.9.1
11	Risk Management Plan	28 days after the Commencement Date	4.10.2
12	Environmental Management Plan (shall include Noise and Vibration Analysis Report)	60 days from the Commencement Date	4.11.1
13	Inspection, Testing, and Commissioning Management Plan	120 days after the Commencement Date	4.12.1 and 9.1.1
14	Earthing and Bonding Study Plan	28 days after the Commencement Date	4.13.1
15	Drawing and CAD Procedure	30 days after the Commencement Date	6.3.3

No.	Plan	To be submitted within	Sub-Section
16	Building Information Model (BIM) Execution Plan for LOD 100 to 500	30 days after the Commencement Date	6.3.4
17	Detailed Training Procedures	6 months prior to the Commencement of Training	14.8
18	Plan for Site Facilities	120 days after the Commencement Date	15.3.1
19	Traffic Control Plan	Before the start of Construction	16.2.8
20	Monthly Progress Reports	Monthly	4.16
21	Spare Parts Management Plan	not later than (12) months prior to the issue of the TOC for a System	4.21.2
22	Requirements Management Plan	30 days after the Commencement Date	21.3
23	Defects Notification Period Management Plan	Before handover	10.2.4
24	Method Statements	56 days prior to the start of construction	6.17
25	Operation and Maintenance Manuals	6 Months before handover	8.1
26	Project Document Control Procedure	28 days after the Commencement Date	7.2
27	Obsolescence Management Plan	within 90 days after commencement Date	22.11

APPENDIX 5 - QUALITY ASSURANCE REQUIREMENTS

5.1. Quality Assurance Management Plan

The Quality Assurance Management Plan shall define the Contractor's management structure and the quality management system for the execution of the Contract Works and shall, without limitation, define as follows:

- (1) The summary of the project requirements including all proposed quality activities;
- (2) All quality assurance and quality assurance procedures proposed by the Contractor for his use in the execution of the Works;
- (3) A list of all the codes of practice, standards, and specifications that the Contractor proposes to apply his work;
- (4) The Contractor’s organization-managerial staff, with particular reference to any member of a partnership, consortium or joint venture, and the main Subcontractors. Organization charts shall be produced to illustrate the subdivision of the Contract Works into elements for effective technical and managerial control, the reporting structure, and the relationship between all parties involved;
- (5) The appointment of a Quality Assurance Manager;
- (6) The specific allocations of responsibility and authority given to managerial and technical staff with particular reference to the design and Site supervision of the Contract Works;
- (7) The hierarchy and structure of the overall quality system documents to be applied to the Contracts, and clearly indicating any particular documents to be followed by individual key members of the Contractor if applicable;
- (8) The Contract specific quality procedures work instruction and/or standard forms, if applicable;
- (9) A full list of quality procedures works instructions, and/or standard forms, including any contract-specific documents, to be applied to the Contract. It shall be defined the specific ways to perform the related activities and the records to be generated as objective evidence of the activities performed or result achieved, and shall cover all the requirements of the Contract including, but not limited to, the following activities:
 - 1) The review, approval, and updating of the quality system documents to ensure their continuing suitability and effectiveness;
 - 2) Design control to all Permanent Works and/or Temporary Works, including design, works carried out by Subcontractors and sub-consultants. The procedures shall clearly define the review and verification;
 - 3) Drawing management in main office and site office(s), including production, approval, updating, maintaining, storage and distribution;
 - 4) Project document management, including registration, updating, indexing, filing, maintenance, storage, and distribution;
 - 5) Monitoring and control of Subcontractors with respect to program, submission, and quality of works;
 - 6) Monitoring of the submission and re-submission to the Engineer;

- 7) Monitoring of the ordering and delivery of materials, plant, and equipment;
- 8) Quality control of the Contract Works;
- 9) Quality audits on the Contractor and Subcontractors of any tiers; and
- 10) Establish and maintain a record in accordance with the Contract requirement provision.

The Quality Assurance Management Plan shall comprise of Management Quality Plan, Design Quality Plan, Manufacturing Quality Plan (including Inspection and Testing), and Testing and Commissioning (including Integrated Testing and Commissioning) Quality Plan.

5.1.1. Management Quality Plan

The Quality Management shall be implemented from the highest management level, and the Top Management of the Contractor JV shall bear overall responsibility for all Quality related matters and activities.

A Management Quality Plan shall be prepared with the organization chart having hierarchy and structure, responsibility and authority allocations, quality procedures, work instructions, and standard forms and recording. The Plan should also include sub-contractors and manufacturers.

An overall organization chart should be prepared that gives the management structure for the Project which is engaged in the design, procurement, management, transportation, construction, and installation. The organization will allow for on-site and off-site functions.

The Contractor's Organization Chart for this project explains the organization position and lines of reporting for the Quality Assurance Manager and any Quality Staff. The Management Quality Plan should discuss the authorities of the Quality Assurance Manager and Quality Staff. The Management Quality Plan should help to plan, assess, and improve the organization's quality system for the Project.

5.1.2. Design Quality Plan

The Contractor shall prepare a Design Quality Plan for any design works. The Design Quality Plan shall define the Contractor's and the Designer's policy for the design works and shall, without limitation, define:

- (1) The organization of the Contractor's and the Designer's design staff; Manufacturing Quality Plan, Testing and Commissioning Quality Plan,
- (2) The specific allocations of responsibilities and authorities given to identified design staff or Subcontractors for particular design works;
- (3) The hierarchy of quality management system documentation for managing and controlling design works, including design works of Subcontractors of any tier; and
- (4) The list of procedures and instructions to be applied to manage and control the quality of the design works.

5.1.3. Manufacturing Quality Plan

Manufacturing Quality Plan shall define the Contractor's management structure and quality management system for the manufacture of the key items of the Contract Works, and the items as requested by the Engineer. Separate Manufacturing Quality Plans shall be prepared for each item of the Contract Works.

The Contractor shall prepare and maintain a full list of all the Manufacturing Quality Plans required for the Contract with submission status and shall submit to the Engineer upon request.

Each Manufacturing Quality Plan shall define, without limitation:

- (1) The scope of works and the item covered by the plan;
- (2) The organization of the Contractor and/or the Subcontractor responsible for the day-to-day management of the manufacture of the item;
- (3) The specific allocations of responsibility and authority are given to personnel for the day-to-day management of the manufacturing activities with particular reference to the supervision, inspection, and testing of works; and
- (4) The specific methods of manufacture, including but not limited to the following:
 - 1) The particulars of the material to be incorporated into the items;
 - 2) The manufacturing process in compliance with drawings and specifications;
 - 3) The identification of referencing requirements for traceability of the manufactured items;
 - 4) The identification of the inspection and test status of the materials and final manufactured items;
 - 5) The disposition of nonconforming materials and manufactured items; and
 - 6) The handling, storage, packaging, preservation, and delivery of the manufactured items.

5.1.4. Inspection and Testing Plans

Under the Manufacturing Quality Plan, Inspection and Testing plans shall be produced for all activities requiring inspection and/or test.

The Contractor shall prepare and maintain a full list of all the inspection and Test Plans required for the Contract with submission status and review status and shall submit to the Engineer upon request.

Each Inspection and Test Plan shall define, without limitation:

- (1) The scope of activity covered by the plan;
- (2) The sequence of work related to the activity covered by the plan;
- (3) The personnel responsible for undertaking the inspection and/or test;
- (4) The personnel responsible for certifying the inspection and test;
- (5) The inspection and/or test method or a reference to the relevant standard of inspection and/or test;
- (6) The frequency of the inspection and/or test;
- (7) The compliance criteria of the inspection and/or test;
- (8) The Quality Hold Point and Quality Assurance Points;
- (9) The documents to be used for reporting the results of the inspection and/or test, and with examples of such documents incorporated into the Inspection and Test Plan; and
- (10) The storage locations and filing of the records of the inspection and/or test.

5.2. Quality Assurance Manager

The Contractor shall appoint a suitably qualified and experienced full-time person as the Quality Assurance Manager to be responsible for the task of establishing the documented quality management system and ensuring that the quality management system is implemented and maintained effectively.

The Quality Assurance Manager shall be directly responsible to the senior level of management and is able to discharge his duties without hindrance or constraint. In addition, the Contractor shall make available any such resources that are necessary to ensure the effective implementation of the quality management system.

The Contractor shall submit for review by the Engineer details of qualifications, experience, authority, and responsibility of the proposed Quality Assurance Manager, as part of the Quality Organization Plan.

5.2.1 Quality Audits

The Contractor shall carry out Quality Audits on the Contract Works at regular intervals, or at such other intervals as the Engineer may require, ensuring the continuing suitability and effectiveness of the quality management system. Reports of each such audit shall be submitted promptly to the Engineer for review.

The Contractor shall submit for review by the Engineer details of the authority, qualifications, and experience of personnel assigned to quality audit activities before carrying out quality audits.

The Engineer may require Quality Audits on the Contractor and his Subcontractors of any tier to be carried out by his representative or the Employer’s staff. In such a case, the Contractor shall afford to such auditors all necessary facilities and access to the activities and records to permit this function to be performed.

Upon receipt of Corrective Action Request (CAR) or similar document issued by the Engineer as a result of Quality Audits, the Contractor shall promptly investigate the matter and submit the proposed corrective and preventive actions within 14 days to the Engineer for review. The Contractor shall take timely corrective and preventive actions to rectify the matter and to prevent re-occurrence. Evidence to demonstrate effective implementation of corrective and preventive actions shall be submitted by the Contractor to the Engineer for review.

5.2.2. Notification of Nonconformities

If, prior to issue of the Taking – Over Certificate for the Contract Works or the relevant Section, the Contractor has used or proposes to use or repair any item of the Contract Works that does not conform to the requirements of the Contract, the Contractor shall immediately submit for review by the Engineer of such proposal and supplying full particulars of the non-conformity and, if appropriate, the proposed means of repair.

If the Engineer issues a non-conformity report or similar documents to notify the Contractor of any item of the Contract Works which does not conform to the requirements of the Contract, the Contractor shall promptly investigate the matter and, within 14 days of notification by the Engineer, submit to the Engineer for review the remedial measures and necessary actions to be taken to rectify the item and to prevent re-occurrence.

The Contractor shall maintain and update a Non-conformity Register to indicate the status of all non-conformities that are identified by the Engineer and/or the Contractor. The Contractor shall submit the register for review upon request by the Engineer.

5.4. Monthly Progress Report on Quality Management System

The Contractor shall continuously monitor the performance of the quality management system and shall include in each Monthly Progress Report:

- (1) The submission status and review the status of the quality system documents;
- (2) An up-to-date audit schedule and status;
- (3) An up-to-date non-conformity register providing the status of all non-conformity identified by the Engineer or the Contractor within the reporting period and those nonconformities not yet satisfactorily closed; and
- (4) A narrative appraisal of the performance of the quality management system, including any non-conformities, shortcomings, or problem areas identified and the corrective and preventative action taken or proposed.

The Contractor shall provide and maintain at all stages of the Contract Works, a quality control register, or registers to identify the status of inspections, sampling, and testing of the work, and all certificates. Such register shall be updated by the Contractor to show all activities in previous months and shall reach the Engineer’s office before the 7th day of each month.

Each register shall:

- (1) List the certificates received for each batch of goods and materials incorporated in the Contract Works and compare this against the certification required by the Contractor and the Contractor’s quality plans;
- (2) List the inspection and testing activities undertaken by the Contractor on each element of the Contract Works and compare these activities against the amount of inspection and testing required by the Contract and the Contractor’s quality plans;
- (3) Show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the pass/fail criteria; and
- (4) Summaries any actions proposed by the Contractor to overcome any nonconformity.

5.5. Quality Records

The Contractor shall ensure that all the quality records as objective evidence of the implementation of the quality management system are properly indexed, filed, maintained, updated, and stored in an acceptable software system. These records will be delivered to the Engineer in CD form upon completion of the Contract Works.

APPENDIX 6- ENGINEERING SAFETY MANAGEMENT PLAN

APPENDIX 7- OUTLINE INTERFACE MATRICES

ANNEX 1 – Civil Packages N-01 to N-05

ANNEX 2 – Civil Packages S-01 to S-07

ANNEX 3 – Civil Package CP05

ANNEX 4 – Civil Packages CP01 and CP02

ANNEX 1 – Civil Packages N-01 to N-05

A1. Substation System (SS-1 to SS-22) and Battery Post (BP-1 to BP-4)

A1.1. Substation & Battery Post (BP) Space and Building, Station, and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, 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 bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01's equipment	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04 05, and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM AFC, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
8	The foundation of CP NS-01 equipment's in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 05, and NS-01 Contractor shall coordinate and agree on the size and location.

A2. Power Distribution System

A2.1. Viaduct

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signalling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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 of the brackets.</p>
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CPNS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree and on the size and location.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall protect the water ingress.</p>

A2. Power Distribution System

A2.2. Station and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location CP NS-01. The contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, 04, and 05 Contractor on the location, size, and drilling method.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 equipment.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04, 05	CP N-01, 02, 03, 04 05, and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	The foundation of CP NS-01 equipment's in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 05, and NS-01 Contractors shall coordinate and agree on the size, weight, and location.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation/replacement	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
8	Oil fence around fuel tank, oil transformers, oil collecting pit, inspection cover, and associated drain pipe.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
9	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM AFC, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for and leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate for the design and agree on the space and access provision, and cavity walls.
10	Cable recess, trough, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
11	Cable recess, troughs, and pipes either across road or parallel to road, beneath road pavement concrete for all roadway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.

A3. Overhead Contact System

A3.1. Viaduct

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signalling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP NS-01 Contractor shall provide the draw wires.</p> <p>CP N-01, 02, 03, and 04 Contractors shall protect the water ingress.</p>

A3. Overhead Contact System

A.3.2 Station and Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01, Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors in station structural frames	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, and 04 Contractors on the location, size, weight, and fixing method.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station and Depot (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 05, and NS-01 Contractor shall coordinate and agree on the size and location. CP-NS-01 Contractors shall supply the earthing devices for the station and depot.
5	Cable recess, trough, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
6	Cable recess, troughs, and pipes either across road or parallel to road, beneath road pavement concrete for all roadway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.

A.3.3 Underground Station and Tunnels

<u>No</u>	<u>Interface Item</u>	<u>Design Requirement</u>	<u>Design</u>	<u>Material Supply</u>	<u>Fix or Construction</u>	<u>Remarks</u>
<u>1</u>	<u>Location and size of Penetrations with sleeves</u>	<u>CP NS-01</u>	<u>CP NS-01</u>	<u>CP NS-01</u>	<u>N-04</u>	<u>N-04 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.</u>
<u>2</u>	<u>Anchor Bolts</u>	<u>CP NS-01</u>	<u>CP NS-01</u>	<u>CP NS-01</u>	<u>CP-NS-01</u>	<u>CP NS-01 Contractor shall design, supply and install all fixings. The anchor bolts designs shall take into consideration the need to insulate the fixing and support from the concrete structure and re-bar. 100% of all drill fixed anchors shall be tested following installation.</u>

A4. Signalling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct

<u>No.</u>	<u>Interface Item</u>	<u>Design Requirement</u>	<u>Design</u>	<u>Material Supply</u>	<u>Fix or Construction</u>	<u>Remarks</u>
<u>1</u>	Cast-in sockets, cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
<u>2</u>	Supporting structures for power, communication, and signalling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-01,02, 03, 04, and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.</p>

3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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 bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.</p>
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractor shall protect the water ingress.</p>

A4. Signalling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.2 Station and Depot

No.	Interface Item	Design Requirements	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location.
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree on the size and location. Sockets that be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.
3	Supporting structures for power, communication, and signalling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, 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 of the brackets.

No.	Interface Item	Design Requirements	Design	Material Supply	Fix or Construction	Remarks
5	Cable recess, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the above-mentioned items	CP NS-01	CP NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate and agree and on the size and location. CP NS-01 Contractor shall provide draw wires. CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall protect the water ingress.
6	Leakage water protection from ceiling of SER, SUR, COM, AFC rooms, etc.	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04, 05 and/or NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP NS-01 Contractor shall provide the space and access route and other requirements for Leakage water treatment. CP N-01, 02, 03, 04, 05, and NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	The foundation of CP NS-01 equipment's in SER, COM, AFC rooms.	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04 and 05	CP N-01, 02, 03, 04, 05, and NS-01 Contractor shall coordinate and agree on the size and location.

A5. Other Facilities in Depot

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	CP N-05 and NS-01 Contractors shall coordinate and agree on the size and location.
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP N-05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
3	Supporting structures for power, communication, and signalling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP N-05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP N-05 and/or NS-01	<p>CP N-05 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 of the brackets.</p>
5	Opening for duct of equipment	CP NS-01	CP NS-01	CP N-05 and/or NS-01	CP N-05 and/or NS-01	CP N-05 Contractor shall coordinate to design the size of the opening based on equipment provided by CP NS-01 Contractor

A6. Automatic Fare Collection System

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04, and NS-01, Contractors shall coordinate and agree on the size and location.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	CP N-01, 02, 03, 04, and NS-01, Contractors shall coordinate and agree on the size and location.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall provide adequate thickness of screed or finishes.</p> <p>CP N-01, 02, 03 and 04 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
4	Cable pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road. Pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall ensure the cable pipes, ducts, etc. which are protected from ingress of water</p> <p>The pulling chambers shall be provided with drainage.</p>
5	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
6	Drilling for anchors	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP N-01, 02, 03, 04 and/or NS-01	CP NS-01 Contractor shall coordinate with CP N-01, 02, 03, and 04 Contractors on the location, size, and drilling method.

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, 04, and 05 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 CP N-01, 02, 03, 04, and 05 Contractors under CP NS-01 Contractor’s supervision.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall implement jointly an inspection before casting.</p>

A.7 Platform Screen Doors

No.	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	Drilling for fixing base plates of PSD	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 Contractors shall provide adequate thickness of screed or finishes.</p> <p>CP N-01, 02, 03 and 04 Contractors shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.</p>
	Cast-in sockets including bolts, nuts, and washers, packings and shims	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03, 04 and/or NS-01	<p>CP N-01, 02, 03, 04, 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>
	Conduits, (pull, junction, and/or surface) boxes, sheet metal trunking, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP NS-01	CP N-01, 02, 03 and 04	<p>CP N-01, 02, 03, 04, and NS-01 Contractor shall coordinate and agree on the size and location.</p> <p>CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, and 04 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 CP N-01, 02, 03, and 04 Contractors under CP NS-01 Contractor’s supervision.</p> <p>CP N-01, 02, 03, 04, and NS-01 Contractors shall implement jointly an inspection before casting.</p>

ANNEX 2 – Civil Packages S-01 to S-07

A1 Substation System (S1, SS-1 to SS-18)

A1.1 Substation Space and Building, Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 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 bolt supplied matches the fixing provisions and that adequate construction tolerances are allowed between the fixing and mounting slots of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01’s equipment	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the location. Supporting fixtures for CP NS-01’s equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01’s equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and location.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
8	The foundations of CP NS-01 equipment in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and location

A2 Power Distribution System

A2.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
2	Supporting structures for power, telecom, and signaling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractor shall coordinate and agree adequate construction tolerances to be allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling method.</p> <p>CP NS-01 Contractor shall ensure that type of bolts supplied to match the fixing provisions and that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recesses and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 shall ensure that the structures containing electrical equipment are watertight and shall undertake tests to prove that as directed by the Engineer.</p>

A2.2 Station, Substations, and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Locations and sizes of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP NS-01 Contractor shall coordinate with CP S-01 to S-07 Contractors on the locations, sizes, and drilling methods.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 TO S-07 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Foundation for CP NS-01's equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
8	Oil bunds around fuel tanks, oil transformers, oil collecting pit, inspection covers, and associated drain pipes.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
9	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP S-01 to S-07 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
10	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.
11	Cable recesses, troughs and pipes either across road or parallel to road, beneath track road pavement concrete for all roadway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.
12	Earthing and grounding system	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. NS-01 Contractor shall supply the earthing devices for station & depot.

A3 Overhead Contact System

A3.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signaling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.</p>

A.3.22 Station, Substations and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors to station structural frames	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07	CP NS-01 Contractor shall coordinate with CP S-01 to S-07 Contractor on the location, size, weight, and fixing method and supply brackets that fix to the existing station frames, i.e., no provision made within the station frames for bracket fixing.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station and Depot (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. The grounding provided by CP S-01 to S-07 will be via the reinforcement in the structure and piles, welded connections where required, and the provision of attachment points for the grounding system. The main room earth bars connected to the station earth will be provided and installed by S-01 to S-07 Contractors but checked by NS-01 Contractors. CP NS-01 Contractor shall supply the earthing devices for station and depot. NS-01 will provide surge arrestors and copper tapes etc. to connect to the earthing points provided by CP S-01 to S-07 Contractors.

A4 Signaling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct, U-shaped Ground Structures, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. Sockets shall be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
2	Supporting structures for power, communication, and signaling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07 and/or NS-01	<p>CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP S-01 to S-07 and NS-01 Contractors shall protect against water ingress.</p>

A.4.2 Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location Sockets that be supplied by CP NS-01 Contractor. CP S-01 to S-07 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
3	Supporting structures for power, communication, and signaling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
5	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP S-01 to S-06 and NS-01 Contractors shall protect against water ingress.
6	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. [BB1] CP S-01 to S-06 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
7	Foundation for CP NS-01's equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.

A5 Electrical and Mechanical Facilities in Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Openings for equipment ducts	CP NS-01	CP NS-01	CP S-01 to S-07 and/or NS-01	CP S-01 to S-07	CP S-01 to S-07 Contractor shall coordinate to design the size of the openings based on equipment provided by CP NS-01 Contractor

A6 Automatic Fare Collection System

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 to S-06 and NS-01, Contractors shall coordinate and agree on the sizes and locations.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	CP S-01 TO S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP S-01 TO S-06 Contractor shall provide adequate thickness of screed or finishes. CP S-01 TO S-06 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.
4	Cable, pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road, pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 TO S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP S-01 TO S-06 Contractor shall ensure the cable, pipes, ducts, etc. are protected from ingress of water, and pulling chambers shall be provided with drainage and lockable covers.
5	Cast-in sockets including bolts, nuts, and washers, packing, and shims.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 shall supply all necessary materials and templates.
6	Drilling anchors for	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	CP S-01 to S-06 and/or NS-01	CP NS-01 Contractor shall coordinate with CP S-01 to S-06 Contractors on the locations, sizes, and drilling methods.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits (pull, junction and/or surface boxes, sheet metal trunking and ducting which are cast into concrete including provision of draw wires.	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP S-01 to S-06 Contractors shall protect all ends and joints or conduits and boxes.</p> <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 CP S-01 to S-06 Contractors under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP S-01 to S-06 and NS-01 Contractors before casting and confirmed after casting.</p>

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	CP S-01 to S-06 and/or NS-01	<p>CP NS-01 Contractor shall coordinate with CP S-01 to S-06 Contractors 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	CP S-01 to S-06	CP S-01 to S-06	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall provide adequate thicknesses of screed and finishes.</p> <p>CP S-01 to S-06 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, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP S-01 to S-06 and/or NS-01	<p>CP S-01 to S-06 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, and ducting, which are cast into concrete and including draw wires.	CP NS-01	CP NS-01	CP S-01 to S-06	CP S-01 to S-06	<p>CP S-01 to S-06 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP S-01 to S-06 Contractors shall execute finishing works including gap filling for recessed / surface mounted boxes/conduits which are installed in advance of the finishing works.</p> <p>CP S-01 to S-06 Contractors 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 CP S-01 to S-06 Contractors under the supervision of CP NS-01 Contractor.</p> <p>All electrical continuity between conduit and rebar shall be inspected and tested jointly by CP S-01 to S-06 and NS-01 Contractors before casting and confirmed after casting.</p>

ANNEX 3 – Civil Package CP05

A1 Substation System (TSS1)

A1.1 Substation Space and Building, Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of penetrations with sleeves, troughs, and pipes	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 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 bolt supplied matches the fixing provisions and that adequate construction tolerances are allowed between the fixing and mounting slots of the brackets.
4	Openings in ceiling panels & access panels for CP NS-01’s equipment	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the location. Supporting fixtures for CP NS-01’s equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Leakage water for CP NS-01 protection from ceiling of SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and CP NS-01 Contractor shall provide the space and access route and other requirements for and Leakage water treatment. CP05 & NS-01 Contractors shall coordinate for the design and agree on the space and access provision, and cavity walls.
7	Lifting points (eye-bolts or similar) for CP NS-01’s	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and location.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	equipment installation / replacement					
8	The foundations of CP NS-01 equipment in SER, SUR, COM, AFC, etc.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and location

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

A2 Power Distribution System

A2.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets (or structural inserts), cast-in bolts, or blind holes in viaducts for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Special kinds of sockets or fittings that shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
2	Supporting structures for power, telecom, and signaling cable for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractor shall coordinate and agree adequate construction tolerances to be allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling method.</p> <p>CP05 and CP NS-01 Contractor shall ensure that type of bolts supplied to match the fixing provisions and that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.</p>
4	Cable recesses and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP05 and CP NS-01 Contractor shall provide draw wires.</p> <p>CP05 shall ensure that the structures containing electrical equipment are watertight and shall undertake tests to prove that as directed by the Engineer.</p>

A2.2 Station, Substations,

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Locations and sizes of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials.
3	Drilling for anchors	CP NS-01	CP NS-01	CP NS-01	CP05	CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, sizes, and drilling methods.
4	Openings in ceiling panels & access panels for all CP NS-01's equipment where required.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. Supporting fixtures for CP NS-01's equipment shall be supplied and installed by CP NS-01.
5	Concrete plinths of CP NS-01 Equipment.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate for the design and agree on the size and locations of the concrete plinths.
6	Foundation for CP NS-01's equipment in SER, SUR COM AFC and like	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.
7	Lifting points (eye-bolts or similar) for CP NS-01's equipment installation / replacement	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Oil bunds around fuel tanks, oil transformers, oil collecting pit, inspection covers, and associated drain pipes.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
9	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP05	CP05	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
10	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.
11	Cable recesses, troughs and pipes either across road or parallel to road, beneath track road pavement concrete for all roadway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.
12	Earthing and grounding system	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. NS-01 Contractor shall supply the earthing devices for station & depot.

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

A3 Overhead Contact System

A3.1 Viaduct, U-shaped Ground Structure, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>Sockets that be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the breakers.</p>
2	Supporting structures for power, telecom, and signaling cable for CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	<p>CP05 and NS-01 Contractors shall coordinate and agree on the size and location.</p> <p>The supporting structures shall be supplied by CP NS-01 Contractor.</p> <p>CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.</p>
3	Cable recesses, troughs, and pipes either across-track or parallel to track, beneath track bed concrete for all trackway, (withdraw wires if necessary), and removable or hinged covers for the mentioned above items.	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	<p>CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.</p> <p>CP NS-01 Contractor shall provide draw wires.</p> <p>CP05 and NS-01 Contractors shall protect against water ingress.</p>

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

A.3.2 Station, Substations

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations.
2	Cast-in sockets (or inserts) including bolts, nuts, and washers, packing and shims	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. CP NS-01 Contractor shall supply all necessary materials and templates.
3	Special structural supports for anchors to station structural frames	CP NS-01	CP NS-01	CP NS-01	CP05	CP NS-01 Contractor shall coordinate with CP05 Contractor on the location, size, weight, and fixing method and supply brackets that fix to the existing station frames, i.e. no provision made within the station frames for bracket fixing.
4	Earthing or grounding devices and wiring for arrester and grounding wire of OCS in station (if necessary) system	CP NS-01	CP NS-01	CP NS-01	CP NS-01	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The grounding provided by CP05 will be via the reinforcement in the structure and piles, welded connections where required, and the provision of attachment points for the grounding system. The main room earth bars connected to the station earth will be provided and installed by CP05 Contractor but checked by NS-01 Contractor. CP NS-01 Contractor shall supply the earthing devices for station and depot. NS-01 will provide surge arrestors and copper tapes etc. to connect to the earthing points provided by CP05 Contractor.

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

A4 Signaling System (SER, SUR, CER, CUR, CCR), Communication System (COM) and Automatic Fare Collection System (AFC)

A.4.1 Viaduct, U-shaped Ground Structures, and Transitions

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Cast-in sockets, cast-in bolts, or blind holes in viaducts/structures for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. Sockets shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
2	Supporting structures for power, communication, and signaling cable for in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerance is allowed between fixing and mounting slots of the supporting structure.
3	Drilling for cable and pipe supports and/or equipment fixings	CP NS-01	CP NS-01	CP NS-01	CP05 Or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
4	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items	CP NS-01	CP NS-01	CP05 or CP NS-01	CP05 or CPNS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires. CP05 and NS-01 Contractors shall protect against water ingress.

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

A.4.2 Station

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location of the penetrations
2	Cast-in sockets, cast-in bolts, or blind holes in structural frame for both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the size and location Sockets that be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
3	Supporting structures for power, communication, and signaling cable in both CP NS-01 temporary and CP NS-01 permanent services.	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the size and location. The supporting structures shall be supplied by CP NS-01 Contractor. CP05 and NS-01 Contractors shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.
4	Drilling for cable and pipe supports and/or equipment fixings.	CP NS-01	CP NS-01	CP NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the locations, bolts sizes, and drilling methods. CP NS-01 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.
5	Cable recess and pipes either across-track or parallel to track, beneath track bed concrete for all	CP NS-01	CP NS-01	CP05 or NS-01*	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 Contractor shall provide draw wires.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
	trackway. (withdraw wires if necessary). And removal or hinged covers for the mentioned above items					CP05 and NS-01 Contractors shall protect against water ingress.
6	Protection against water ingress from/through ceiling of SER, SUR, COM, AFC, etc. for CP NS-01 equipment	CP NS-01	CP NS-01	CP05	CP05	CP NS-01 Contractor shall provide the space and access route and other requirements for any equipment shielding to protect against water ingress through ceiling. CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes and locations and any cavity walls.
7	Foundation for CP NS-01’s equipment in SER, SUR, COM, AFC and like	CP NS-01	CP NS-01	CP05 or NS-01	CP05 or CP NS-01*	CP05 and NS-01 Contractors shall coordinate for the design and agree on the sizes, weights, and locations.

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

A5 Electrical and Mechanical Facilities in Station and Depot

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Openings for equipment ducts	CP NS-01	CP NS-01	CP05 or NS-01*	CP05	CP05 Contractor shall coordinate to design the size of the openings based on equipment provided by CP NS-01 Contractor

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

A6 Automatic Fare Collection System

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
1	Location and size of Penetrations with sleeves	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
2	Box outs – full or part depth.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01, Contractors shall coordinate and agree on the sizes and locations.
3	Recesses and trenches formed in screed or finishes for CP NS-01 services.	CP NS-01	CP NS-01	CP05	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP05 Contractor shall provide adequate thickness of screed or finishes. CP05 Contractor shall provide the removable or hinged covers and frames (where required) in finishes over recesses and trenches.
4	Cable, pipes, ducts, etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement, and road, pulling chambers (where required) with covers.	CP NS-01	CP NS-01	CP NS-01	CP05	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP05 Contractor shall ensure the cable, pipes, ducts, etc. are protected from ingress of water, and pulling chambers shall be provided with drainage and lockable covers.
5	Cast-in sockets including bolts, nuts, and washers, packing, and shims.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations. CP NS-01 shall supply all necessary materials and templates.
6	Drilling for anchors	CP NS-01	CP NS-01	CP05 or NS-01*	CP05 or NS-01*	CP NS-01 Contractor shall coordinate with CP05 Contractor on the locations, sizes, and drilling methods.

No	Interface Item	Design Requirement	Design	Material Supply	Fix or Construction	Remarks
7	Conduits (pull, junction and/or surface boxes, sheet metal trunking and ducting which are cast into concrete including provision of draw wires.	CP NS-01	CP NS-01	CP NS-01	CP05 or NS-01*	<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> <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 NS-01 Contractors before casting and confirmed after casting.</p>

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

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	CP05 and NS-01 Contractors shall coordinate and agree on the sizes and locations.
8	Insulation Membrane	CP NS-01	CP05	CP05	CP05	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

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. 34k749.08134k751 (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. 34k75134k749.081 (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

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>	Rail-wheel interface study	Provision of wheel interface information to be used in rail-wheel interface study
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 <u>and 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>

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>	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	CP107 shall interface for the development of an interface matrix and interface at all stages of the project with NS-01.

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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>		

The Malolos – Clark Railway Project and the North
South Railway Project-South Line (Commuter)
CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
Section V1. Employer's Requirements
General Requirements

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.		

The Malolos – Clark Railway Project and the North
 South Railway Project-South Line (Commuter)
 CP NS-01: E&M Systems and Track Works

Part 2 – Employer's Requirements
 Section V1. Employer's Requirements
 General Requirements

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

2.12.11 Automatic Train Operation (ATO) System

ATO mode shall be the normal mode of operation. ATO shall conform to SIL level as specified by European Union Agency for Railways (ERA) while publishing relevant subsets.

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

2.12.11 Automatic Train Operation (ATO) System

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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

unless the Contractor proposes a different configuration, which is considered beneficial to both the project and the Employer. The Contractor shall justify any arrangement, which does not adopt the centralized method of control and monitoring. Control of the Depot Signaling system shall be independent from the mainline CATS having a separate duplicated ATS server system with automatic switchover of control.

All Workstations, printers and the Overview Mimic Display System shall be located within in the Central Control Room. All ATS central Servers, FEPs, workstations and archiving servers shall be located in the Central Equipment Room, notwithstanding any alternative arrangements proposed by the Contractor.

The ATS system shall have data processing facilities and achieve the minimum following main functions, but shall not be limited to:

- 1) Monitoring of ETCS equipment (Interlocking, Train Detection, Signals, switch machines, etc.);
- 2) Perform automatic route setting, automatic train regulation etc.;
- 3) Train Descriptor, Monitor and regulate train movement continuously;
- 4) Initiate information for PIDS and PA systems;
- 5) Generation of the schedules;
- 6) Playback and Recording Facility;
- 7) Training facilities for operators; and
- 8) Operation assistance including generating alarms and store system-operating data.
- 9) The ATO trackside (ATO-TS) sub-system will be an important part of the ATS system. It will communicate with the onboard ATO-OB via GSM-R radio system as per UNISIG subset 126. It will provide the Journey Profiles (JP) and Segment Profiles (SP) that ATO-OB requires for traction / brake control, with stopping points, timing points and other details.

The ATS functions shall be implemented in a way to derive benefit from the characteristics of an ETCS system namely:

- 1) Train location information to a high precision;
- 2) Continuous wayside to train and train to wayside data communications link; and
- 3) Train borne and wayside data processing capabilities.

The ATS sub-system is divided into three categories:

- 1) Category 1: Central Operation: Automatic train control operation from the Central ATS server at OCC;
- 2) Category 2: Communication with external systems and Local train control operation. Automatic train control operation from Local ATS server at station; and
- 3) Category 3: Off-line operations.

The ATS sub-system component of Category 1 shall be composed of a Local Redundant LAN at the OCC, and Operator workstations. The Communication system shall provide redundant IEEE 802.3 Giga-Bit Ethernet channels from the Operation Control Centre to the Signaling equipment rooms (provided with Interlocking logic) within the mainline and depot. The Communication system shall also provide redundant Gigabit Ethernet channels from OCC to each station including the Depot. These channels will be used for transmitting signaling controls and indications for the ETCS level 2 system. Interface between software

unless the Contractor proposes a different configuration, which is considered beneficial to both the project and the Employer. The Contractor shall justify any arrangement, which does not adopt the centralized method of control and monitoring. Control of the Depot Signaling system shall be independent from the mainline CATS having a separate duplicated ATS server system with automatic switchover of control.

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- 3) Train Descriptor, Monitor and regulate train movement continuously;
- 4) Initiate information for PIDS and PA systems;
- 5) Generation of the schedules;
- 6) Playback and Recording Facility;
- 7) Training facilities for operators; and
- 8) Operation assistance including generating alarms and store system-operating data.
- 9) The ATO trackside (ATO-TS) sub-system will be an important part of the ATS system. It will communicate with the onboard ATO-OB via GSM-R radio system as per UNISIG subset 126. It will provide the Journey Profiles (JP) and Segment Profiles (SP) that ATO-OB requires for traction / brake control, with stopping points, timing points and other details.

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- 1) Category 1: Central Operation: Automatic train control operation from the Central ATS server at OCC;
- 2) Category 2: Communication with external systems and Local train control operation. Automatic train control operation from Local ATS server at station; and
- 3) Category 3: Off-line operations.

The ATS sub-system component of Category 1 shall be composed of a Local Redundant LAN at the OCC, and Operator workstations. The Communication system shall provide redundant IEEE 802.3 Giga-Bit Ethernet channels from the Operation Control Centre to the Signaling equipment rooms (provided with Interlocking logic) within the mainline and depot. The Communication system shall also provide redundant Gigabit Ethernet channels from OCC to each station including the Depot. These channels will be used for transmitting signaling controls and indications for the ETCS level 2 system. Interface between software

Table 8.13 Special Equipment and Tools of the railway system and the rolling stock

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
N01	Light Repair Shop	On-board Signal equipment tester	✓		
		On-board Telecommunications equipment tester	✓		
		Rewriting device for internal, external and public address display system	✓		
		Portable test unit for TMS (with software)		✓	✓
		Portable test unit for traction controller (with software)		✓	✓
		Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
		Portable test unit for Brake control unit (with software)		✓	✓
		Portable test unit for Air Conditioning Unit (with software)		✓	✓
		Disc Brake replacing tool	✓		
		Handheld thermal imaging cameras	✓		
		Shock pulse and Vibration analysers for machines	✓		
		Real time wheel geometry measurement system	✓		
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
N02	Unscheduled Repair Shop	Wheel load measuring device, portable type (system for 4 axles)	✓		
N13	Car Body Shop	Special tools for removal and installations of coach doors	✓		
N16	Traction Motor Shop	Motor disassembling/reassembling tools	✓		
N17	Bogie Shop	Bogie disassemble/reassemble special tools	✓		
N18	Air conditioner Shop	Special tools for air conditioner overhaul	✓		

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
		Test Equipment for Air Conditioner Unit		✓	✓
N19	Electric Parts Shop including Electronic Room	High voltage insulation tester	✓		
		Contactor and High Speed Circuit Breaker (HSCB) tester	✓		
		Solenoid valve test bench	✓		
		Relay tester	✓		
		Door operating device tester	✓		
		On-board Signal equipment tester	✓		
		On-board Telecommunication equipment tester	✓		
		Speed sensor tester	✓		
		Electronic Worktables with ESD protection	✓		
		Soldering and de-soldering stations	✓		
		Multipurpose Power Supplies	✓		
		Digital Storage Oscilloscopes	✓		
N22	Spring, Air Spring & Iron workshop	Special tools for air-spring overhaul	✓		
		Special tools for damper overhaul	✓		
N23	Tight Lock Coupler and Draft Gear Shop	Special tool for draft gear	✓		
N25	Air Brake	Test Equipment for Brake Control Unit		✓	✓

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
	Valve Shop	Brake valve test bench	✓		
		Special tools for air valve overhaul	✓		
		Special tools for compressor overhaul	✓		
N31	Final Adjustment Shop	On-board Signal equipment tester	✓		
		On-board Telecommunications equipment tester	✓		
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Wheel load measuring device, portable type (system for 4 axles)	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
		Portable test unit for TMS (with software)		✓	✓
		Portable test unit for traction controller (with software)		✓	✓
		Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
		Portable test unit for Brake control unit (with software)		✓	✓
		Portable test unit for Air Conditioning Unit (with software)		✓	✓

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
South Depot			CP NS-01	CP NS-02	CP NS-03
S01	Light Repair Shop	On-board Signal equipment tester	✓		
		On-board Telecommunications equipment tester	✓		
		Rewriting device for internal, external and public address display system	✓		
		Portable test unit for TMS (with software)		✓	✓
		Portable test unit for traction controller (with software)		✓	✓
		Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
		Portable test unit for Brake control unit (with software)		✓	✓

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
South Depot			CP NS-01	CP NS-02	CP NS-03
		Portable test unit for Air Conditioning Unit (with software)			
		Disc Brake replacing tool	✓		
		Handheld thermal imaging cameras	✓		
		Shock pulse and Vibration analysers for machines	✓		
		Real time wheel geometry measurement system	✓		
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
S02	Unscheduled Repair Shop	Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Wheel load measuring device, portable type (system for 4 axles)	✓		

8.10 Depot/Workshop Layout

The layout of the depot/workshop for the Rolling Stock maintenance is based on the following assumptions for reference.

8.10.1 North Depot Layout

The basic concepts of Depot Layout are followings.

8.10.1.1. Light Repair Shop (N01)

The light repair shop is located in a place where trains can move from/to the storage track easily.

8.10.1.2. Unscheduled Repair Shop (N02)

- The unscheduled repair shop is located in a place where trains can move from the storage track easily.
- The unscheduled repair shop is located for transport the parts from/to workshop.

8.10.1.3. Car body Washer (N04)

The location is in a place where car bodies can be washed during moving between storage tracks and Light Repair Shop, and between storage tracks and a lead track.

8.10.1.4. Storage Track

Table 8.13 Special Equipment and Tools of the railway system and the rolling stock

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
N01	Light Repair Shop	On-board Signal system equipment tester	✓		
		On-board Telecommunications equipment tester (if necessary)	✓		
		Rewriting device for internal, external and public address display system	✓		
		Rewriting device for external display system			
		Rewriting device for public address system			
		Portable test unit for TMS log reader (with software)		✓	✓
		VVVF log reader Portable test unit for traction controller (with software)		✓	✓
		APS log reader Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
		Portable test unit for Break Brake ontrol unit log reader (with software)		✓	✓
		Portable test unit for Air Conditioning Unit (with software)		✓	✓
		Disc Brake pad replacing tool	✓		
		PSD device log reader			
		PSD device tester			
		Handheld thermal imaging cameras	✓		
		Shock pulse and Vibration analysers for machines	✓		
		Real time wheel geometry measurement system	✓		
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
N02	Unscheduled Repair Shop	Wheel load measuring device, portable type (system for 4 axles)	✓		
N12	Bogie Removal/ Installation Shop	Radius arm gauge			
N13	Car Body Shop	Special tools for removal and installations of coach doors	✓		
N16	Traction Motor Shop	Motor disassembling/reassembling tools	✓		
		WN coupling extractor			
		Non disassembling bearing exchange special tool			
N17	Bogie Shop	Bogie disassemble/reassemble special tools	✓		
		Lock bolt for axle spring			
N18	Air conditioner Shop	Special tools for air conditioner overhaul	✓		
		Refrigerant extractor Test Equipment for Air Conditioner Unit (ACU)		✓	✓
		Refrigerant filler			

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
		Gas leakage tester			
		Cleaner for special parts			
N19	Electric Parts Shop including Electronic Room	HB tester			
		High voltage device insulation tester	✓		
		Contactor and High Speed Circuit Breaker (HSCB) tester	✓		
		Solenoid valve-tester bench	✓		
		Electronic Relay tester	✓		
		Door operating device tester	✓		
		On-board Signal System equipment tester	✓		
		TMS data reader and analyzer			
		Failure data reading device			
		On-board Telecommunication equipment tester	✓		
		Speed sensor tester	✓		
		VVVF inverter module tester			
		Auxiliary Inverter module tester			
		VVVF log reader			
		Master Controller Tester			
		Electronic Worktables 10 No. (with ESD protection)	✓		
		Soldering and de- s soldering stations 10 No.	✓		
		Multipurpose Power Supplies 10 No.	✓		
		Digital Storage Oscilloscopes 10 No.	✓		
N21	Bearing Shop	Cleaners for special parts			
N22	Spring, Air Spring & Iron workshop	Special tools for air-spring overhaul	✓		
		Special tools for damper overhaul	✓		
N23	Tight Lock Coupler and Draft Gear Shop	Special tool for draft gear	✓		
N25	Air Brake Valve Shop	Test equipment for Break Brake Control Unit log reader		✓	✓

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
North Depot			CP NS-01	CP NS-02	CP NS-03
		Brake valve test equipment bench	✓		
		Special tools for air valve overhaul	✓		
		Special tools for compressor overhaul	✓		
N31	Final Adjustment Shop	On-board Signal system equipment tester	✓		
		On-board Telecommunications equipment tester (if necessary)	✓		
		TMS log reader			
		Functional tester for a single car (if necessary)			
		PSD device log reader			
		PSD device tester			
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Wheel load measuring device, portable type (system for 4 axles)	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
		Portable test unit for TMS (with software)		✓	✓
		Portable test unit for traction controller (with software)		✓	✓
		Portable test unit for Auxiliary Power Supply equipment (with software)		✓	✓
		Portable test unit for Brake control unit (with software)		✓	✓
		Portable test unit for Air Conditioning Unit (with software)		✓	✓
-	Test track	Facilities to check the train speed for Signal System			

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
South Depot			CP NS-01	CP NS-02	CP NS-03
S01	Light Repair Shop	On-board Signal system equipment tester	✓		
		On-board Telecommunications equipment tester (if necessary)	✓		
		Rewriting device for internal, external and public address display system	✓		
		Rewriting device for external display system			
		Rewriting device for public address system			
		Portable test unit for TMS log reader (with software)		✓	✓
		VVVF log reader Portable test unit for traction controller (with software)		✓	✓
		APS log reader Portable test unit for auxiliary power supply equipment (with software)		✓	✓

Equipment Group No.	Shop Name	Special Equipment and Tools	Supply		
South Depot			CP NS-01	CP NS-02	CP NS-03
		Portable test unit for Break Brake control unit log reader (with software)		✓	✓
		Portable test unit for Air Conditioning Unit (with software)		✓	✓
		Disc Brake pad replacing tool	✓		
		PSD device log reader			
		PSD device tester			
		Handheld thermal imaging cameras	✓		
		Shock pulse and Vibration analysers for machines	✓		
		Real time wheel geometry measurement system	✓		
		Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Handheld battery-operated oscilloscope, DMM and power analyzer	✓		
S02	Unscheduled Repair Shop	Wheel measurement devices, portable, non-contact type	✓		
		Wheel measurement devices, portable, full-contact type	✓		
		Wheel load measuring device, portable type (system for 4 axles)	✓		

8.10 Depot/Workshop Layout

The layout of the depot/workshop for the Rolling Stock maintenance is based on the following assumptions for reference.

8.10.1 North Depot Layout

The basic concepts of Depot Layout are followings.

8.10.1.1. Light Repair Shop (N01)

The light repair shop is located in a place where trains can move from/to the storage track easily.

8.10.1.2. Unscheduled Repair Shop (N02)

- The unscheduled repair shop is located in a place where trains can move from the storage track easily.
- The unscheduled repair shop is located for transport the parts from/to workshop.

8.10.1.3. Car body Washer (N04)

The location is in a place where car bodies can be washed during moving between storage tracks and Light Repair Shop, and between storage tracks and a lead track.

8.10.1.4. Storage Track

S71 TOOLS

S71.01 Measuring Instruments, Gauges

1. Quantity: One (1) lot
2. Functional Requirements
 - 2.1. The following one (1) lot of measuring Instruments and gauges shall be provided for general measuring purpose, which shall be durable and of high quality:
 - 2.2. Measuring Instruments and gauges shall provide the latest type of the following:
 - a. 4 sets: micrometer, outside, 0 – 225 mm,
 - b. 4 sets: micrometer, inside, 6 – 100 mm,
 - c. 1 pc: vernier caliper, 0 – 150 mm,
 - d. 1 pc: vernier caliper, 0 – 200 mm,
 - e. 3 sets: vernier caliper, 0 – 300 mm,
 - f. 3 sets: vernier caliper, 0 – 400 mm,
 - g. 1 set: height gauge,
 - h. 1 set: depth gauge,
 - i. 1 set: dial indicator with magnetic base and arm,
 - j. 1 set: thickness gauge (feeler gauge),
 - k. 4 sets: steel ruler, 20 cm, 30 cm, 100 cm,
 - l. 1 set: surface plate,
 - m. 3 sets: torque wrench (0 - 50 N-m),
 - n. 3 sets: torque wrench (0 - 200 N-m),
 - o. 2 sets: torque wrench (0 - 300 N-m),
 - p. 2 sets: torque wrench (0 - 1000 N-m),
 - q. 2 sets: torque screwdriver tools group
 - r. 4 sets: convex scale, 5 m,
 - s. 4 pcs: measuring tape, 20 m,
 - t. 4 pcs: digital multi mater,
 - u. 4 pcs: ampere meter, digital, clamp type,
 - v. 4 sets: insulation tester (megger),
 - w. 1 pc: direct current tester, under 1.2 mA,
 - x. 1 set: oscilloscope, portable, with LCD screen,
 - y. 2 pcs: contactless thermometers, 0 - +400 deg., digital type,
 - z. 1 pc: sound level meter, digital type,
 - aa. 4 sets: Handy Force Gauge, digital type,
 - bb. 41 sets: Laptop Computer (Minimum indicative specifications RAM: 8GB, SDD: 500GB, 15.6" Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)
3. Eligible Supplier

There is no preference.

S71 TOOLS

S71.01 Measuring Instruments, Gauges

1. Quantity: One (1) lot
2. Functional Requirements
 - 2.1. The following one (1) lot of measuring Instruments and gauges shall be provided for general measuring purpose, which shall be durable and of high quality:
 - 2.2. Measuring Instruments and gauges shall provide the latest type of the following:
 - a. 4 sets: micrometer, outside, 0 – 225 mm,
 - b. 4 sets: micrometer, inside, 6 – 100 mm,
 - c. 1 pc: vernier caliper, 0 – 150 mm,
 - d. 1 pc: vernier caliper, 0 – 200 mm,
 - e. 3 sets: vernier caliper, 0 – 300 mm,
 - f. 3 sets: vernier caliper, 0 – 400 mm,
 - g. 1 set: height gauge,
 - h. 1 set: depth gauge,
 - i. 1 set: dial indicator with magnetic base and arm,
 - j. 1 set: thickness gauge (feeler gauge),
 - k. 4 sets: steel ruler, 20 cm, 30 cm, 100 cm,
 - l. 1 set: surface plate,
 - m. 3 sets: torque wrench (0 - 50 N-m),
 - n. 3 sets: torque wrench (0 - 200 N-m),
 - o. 2 sets: torque wrench (0 - 300 N-m),
 - p. 2 sets: torque wrench (0 - 1000 N-m),
 - q. 2 sets: torque screwdriver tools group
 - r. 4 sets: convex scale, 5 m,
 - s. 4 pcs: measuring tape, 20 m,
 - t. 4 pcs: digital multi mater,
 - u. 4 pcs: ampere meter, digital, clamp type,
 - v. 4 sets: insulation tester (megger),
 - w. 1 pc: direct current tester, under 1.2 mA,
 - x. 1 set: oscilloscope, portable, with LCD screen,
 - y. 2 pcs: contactless thermometers, 0 - +400 deg., digital type,
 - z. 1 pc: sound level meter, digital type,
 - aa. 4 sets: Handy Force Gauge, digital type,
 - ~~bb. 2sets: Wheel measuring device, portable type. (measurement item: Wheel profile, diameter, clearance etc.)~~
 - ~~cc. 1 set: Wheel load measuring devise, portable type. (Load cell unit, Rail set, Power unit, etc.)~~
 - dd. 41 sets: Laptop Computer (Minimum indicative specifications RAM: ~~4GB~~ 8GB, ~~HDD~~ SDD: ~~320GB~~ 500GB, ~~13.3"~~ 15.6" Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)
3. Eligible Supplier

There is no preference.

S71.03 Special Equipment and Tools

1. Quantity: One (1) lot

The following special tools shall be supplied, but not limited to;

- a. Wheel measurement devices, portable, non-contact type: 2 sets
- b. Wheel measurement devices, portable, full contact type: 2 sets
- c. Wheel load measuring device, portable type (system for 4 axles): 1 set
- d. Real time wheel geometry measurement system: 1 set
- e. On-board Signal equipment tester: 1 set
- f. On-board Telecommunication equipment tester: 1 set
- g. Re-writing devices for internal, external and public address display systems: 4 sets
- h. Disc Brake replacing tool: 1 set
- i. Handheld thermal imaging cameras: 1 set
- j. Shock pulse and Vibration analyzers for machines: 1 set
- k. Handheld battery-operated oscilloscope/DMM/power analyzer: 1 set

2. Functional Requirements: Tools/equipment/facilities for rolling stock maintenance that is assumed not to procure at general commercial markets are treated as special tools and test equipment of the railway system and rolling stock. Special tools and test equipment are to be planned and supplied in close consultation and interfacing with Rolling Stock supplier and other railway systems at appropriate time with approval of Engineer.

2.1. Actual requirement and specifications shall be reviewed and finalized as per the maintenance requirement of the NSCR Rolling stock.

2.2. Design: These specifications are for reference only and actual design and specifications may vary and depend upon final rolling stock design and requirement.

- a. Wheel measuring devices, portable type, non-contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement, etc.
 - i. Portable device consists of equipment for precise measuring of the entire wheel that uses laser to complete without contact.
 - ii. The sensor consists of multiple lasers and is housed in an appropriate IP casing that is connected to a computer/tablet PC unit when taking the measurements. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the MMS.
 - iii. RS identification (train, car, bogie, wheel location, date and technician ID's) can be input as related measurements.
 - iv. Reference standards shall be provided for automatic re-calibration.
- b. Wheel measuring devices, portable type, full contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement etc.
 - i. Portable device consists of equipment for precise measuring of the entire wheel that uses full contact measurement system with optical encoders and Bluetooth/WiFi connectivity for data transmission to PDA/Tablet.
 - ii. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the CMMS.
 - iii. Reference standards shall be provided for automatic re-calibration.
- c. Wheel load measuring device, portable type (system for 4 axles)

- i. Portable contact force measuring each wheel load of one EMU (8wheel/car) at the same time to confirm the wheel load distribution and deviation required by the EMU maintenance manual are to be within acceptable range Contains one pair of load cells for each axle, with a total of four measurement sections to provide total weight measurement of a single twin-bogie vehicle.
 - ii. Measurement results shall be recorded and indicated in the panel with alarm when load deviation exceeds the range. Result of each car shall be consolidated into one data file for one train and stored in the system, can download via USB and can be integrated to CMMS.
 - iii. The system shall be installed in the entrance rails of the Light Repair Shop Unscheduled Repair Shop and design shall consider self-propulsive condition of EMU such as the effect of return current.
 - iv. It shall be designed for bogie distance of 13,800mm, wheel base 2,100mm and axle load max. approx. 16 tons.
 - v. Measurement shall be capable on stopping condition with accuracy shall be within +/- 500mm. One axle measurement shall be possible.
 - vi. Close interface shall be taken with Rolling Stocks contractors to confirm design and performance conditions.
- d. Real time wheel geometry measurement system
 - i. The system is for contactless automatic measurement of geometrical parameters of railway wheels and uses a combination of 2D laser scanners, mounted wayside in the track area.
 - ii. The system is intended to perform the following but not limited to;
 - iii. Vehicle detection and identification – to detect train and identify train number.
 - iv. Wheel Profile Measuring – to measure wheel profile and derived parameters (flange height, flange thickness, flange scope, root wear, wheel tread hollow, wheel rim thickness, flange rollover, tread rollover, wheel diameter, wheel width, back-to-back distance)
 - v. All measurement readings for all the wheels are sent through Ethernet to control computer for profiles reconstruction and dimensions calculations. Finally, all the data are collected in the host depot computer in wheel sets wear database and linked to CMMS servers/workstation in Depot. Data shall be available and can be linked in NSRP depots.
 - vi. Close interface is necessary with all systems in NSRP lines.
 - vii. Calibration tools shall be part of the contractor to supply.
- e. On-board Signal equipment tester – system used to test on board signaling equipment while on-board train and or station. Precision handheld RF transmission lines and antenna tester return loss/SWR and fault location measurement instrument, with frequency coverage. Close interface shall be taken with necessary interfacing parties for design and performance conditions.
- f. On-board Telecommunication equipment tester - system used to test on board Telecommunication equipment while on-board train and or at station. Close interface shall be taken with necessary interfacing parties for design and performance conditions.
- g. Re-writing devices for internal, external and public address display systems - Portable handheld devices to diagnose, modify and monitor the functional data and software of various display systems in the rolling stock to suit the operational and maintenance requirements. Close interface with interfacing parties for design and performance conditions.

- h. Disc Brake replacing tool – They shall be used to utilize maintenance for disc brake unit. Shall be composed but not limited to: (i.e. Hydraulic press assembly, pin guide, jigs, special wrenches, set of wrenches). Close interface shall be taken with Rolling Stock contractors for design and performance conditions.
- i. Handheld thermal imaging cameras – Uses thermal imaging to locate electrical, mechanical problems, hot spots and other heat issues before they turn into costly failures & production downtime or electrical fires. It shall be used for thermal scanning of electrical circuits, panel boards, components, motor control cabinets, breaker panels for non-contact thermal images and temperature measurements to assess equipment and circuit conditions. IR Resolution – 172,800 pixels (480 × 360), Remote Control and Streaming Video via Wi-Fi. Accuracy – Calibrated within +/- 2°C or +/- 2% of reading, Temperature range -40°C to 650°C, Thermal sensitivity <0.04°C at 30°C, Digital Zoom 4X Continuous or better, Image Storage 1000 radiometric JPEG images (SD card memory), Focus- Manual or Automatic (one shot). Accessories shall include: SD Memory Card, 100-260V AC adaptor/charger, two Li-Ion rechargeable batteries, 2-bay battery charger, power supply (with multi-plugs), Software, USB cable, video cable, Bluetooth® headset, lens cap, neckstrap, and hard case.
- j. Shock Pulse Meter and Vibration Analyzer for rotating machines: - Shock Pulse Meter (SPM) cum Vibration analyser is a handheld device for a fast, easy, and reliable diagnosis of the operating condition of rolling element bearings of traction and other auxiliary motors of Rolling stock. It shall provide easy-to-understand condition evaluation in a green-yellow-red scale, as well as crystal-clear spectrums and time signals for further analysis. Basic features are as follows: Three channel simultaneous vibration monitoring. Frequency range DC to 40 kHz, Dynamic range >100 dB, 24 bit AD, Up to 25600 line FFT spectrum, Pre-fault symptoms for spectrum analysis, Simultaneous recording for up to 50 hours, Enveloping, true zoom, synchronous measurement, Stroboscope input/output for rpm measurement, Download thousands of measuring points, Current and voltage input, 0 –20 mA / 0 –10 V, Motor current analysis, Speed measurements 1– 120 000 rpm, Stethoscope function, earphones, 4.3” TFT colour display with automatic back light, Programmable function keys, One hand operation, right or left, Accepts IEPE standard vibration transducers, Carbon-fiber-reinforced enclosure, IP65.
- k. Handheld battery-operated Oscilloscope with DMM and power analyzer functions – the system shall be used for electrical and power electronics measurements. It shall combine a full featured real-time oscilloscope with a True RMS digital multimeter in rugged, battery-operated instruments. Scope and meter modes can operate simultaneously and independently on the same or separate signals. Basic features are as follows but not limited to:
 - i. It shall allow testing and verifying correct operation of motors, efficiency, verifying power supply performance and measuring the effect of neutral current.
 - ii. It shall have dual channel 100 MHz dual channel oscilloscope function to enable troubleshooting and verification of electronic control circuits.
 - iii. It shall be able to measure Harmonics up to 31st (Fundamental from 30 Hz to 450 Hz)
 - iv. Automatic Power Measurement with Statistics
 - v. Advanced Trigger – Delay, Pulse, Video (Line Count and Field Select), PWM Motor Drive
 - vi. Accessories shall include but not limited to tough case and 1 kV High-voltage Probes.

3. Eligible Supplier

There is no preference.

END OF PART B OF APPENDIX 8.1

N71 TOOLS

N71.01 Measuring Instruments, Gauges

1. Quantity: One (1) lot
2. Functional Requirements
 - 2.1. The following one (1) lot of measuring Instruments and gauges shall be provided for general measuring purpose, which shall be durable and of high quality:
 - 2.2. Measuring Instruments and gauges shall provide the latest type of the following:
 - a. 27 sets: micrometer, outside, 0 – 225 mm,
 - b. 27 sets: micrometer, inside, 6 – 100 mm,
 - c. 2 pcs: Vernier caliper, 0 – 150 mm,
 - d. 2 pcs: Vernier caliper, 0 – 200 mm,
 - e. 27 sets: Vernier caliper, 0 – 300 mm,
 - f. 27 sets: Vernier caliper, 0 – 400 mm,
 - g. 2 sets: height gauge,
 - h. 2 sets: depth gauge,
 - i. 2 sets: dial indicator with magnetic base and arm,
 - j. 2 sets: gauge block set,
 - k. 2 sets: thickness gauge (feeler gauge),
 - l. 37 sets: steel ruler, 20 cm, 30 cm, 100 cm,
 - m. 2 sets: surface plate,
 - n. 1 set: V block set,
 - o. 35 sets: torque wrench (0 - 50 N-m),
 - p. 32 sets: torque wrench (0 - 200 N-m),
 - q. 30 sets: torque wrench (0 - 300 N-m),
 - r. 28 sets: torque wrench (0 - 1000 N-m),
 - s. 20 sets: torque screwdriver tools group,
 - t. 29 sets: convex scale, 5 m,
 - u. 29 pcs: measuring tape, 20 m,
 - v. 14 pcs: digital multi mater,
 - w. 10 pcs: ampere meter, digital, clamp type,
 - x. 10 sets: insulation tester (megger),
 - y. 3 pcs: direct current tester, under 1.2 mA,
 - z. 3 sets: oscilloscope, portable, with LCD screen,
 - aa. 5 sets: handy tachometer, digital type,
 - bb. 6 pcs: contactless thermometers, 0 - +400 deg., digital type,
 - cc. 1 pc: sound level meter, digital type,
 - dd. 10 sets: Handy Force Gauge, digital type,
 - ee. 149Sets: Laptop Computer (Minimum indicative specifications RAM: 8GB, SDD: 500GB, 15.6” Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)
3. Eligible Supplier

There is no preference.

N71 TOOLS

N71.01 Measuring Instruments, Gauges

1. Quantity: One (1) lot
2. Functional Requirements
 - 2.1. The following one (1) lot of measuring Instruments and gauges shall be provided for general measuring purpose, which shall be durable and of high quality:
 - 2.2. Measuring Instruments and gauges shall provide the latest type of the following:
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 - b. 27 sets: micrometer, inside, 6 – 100 mm,
 - c. 2 pcs: Vernier caliper, 0 – 150 mm,
 - d. 2 pcs: Vernier caliper, 0 – 200 mm,
 - e. 27 sets: Vernier caliper, 0 – 300 mm,
 - f. 27 sets: Vernier caliper, 0 – 400 mm,
 - g. 2 sets: height gauge,
 - h. 2 sets: depth gauge,
 - i. 2 sets: dial indicator with magnetic base and arm,
 - j. 2 sets: gauge block set,
 - k. 2 sets: thickness gauge (feeler gauge),
 - l. 37 sets: steel ruler, 20 cm, 30 cm, 100 cm,
 - m. 2 sets: surface plate,
 - n. 1 set: V block set,
 - o. 35 sets: torque wrench (0 - 50 N-m),
 - p. 32 sets: torque wrench (0 - 200 N-m),
 - q. 30 sets: torque wrench (0 - 300 N-m),
 - r. 28 sets: torque wrench (0 - 1000 N-m),
 - s. 20 sets: torque screwdriver tools group,
 - t. 29 sets: convex scale, 5 m,
 - u. 29 pcs: measuring tape, 20 m,
 - v. 14 pcs: digital multi mater,
 - w. 10 pcs: ampere meter, digital, clamp type,
 - x. 10 sets: insulation tester (megger),
 - y. 3 pcs: direct current tester, under 1.2 mA,
 - z. 3 sets: oscilloscope, portable, with LCD screen,
 - aa. 5 sets: handy tachometer, digital type,
 - bb. 6 pcs: contactless thermometers, 0 - +400 deg., digital type,
 - cc. 1 pc: sound level meter, digital type,
 - dd. 10 sets: Handy Force Gauge, digital type,
 - ~~ee. 4 sets: Wheel measuring device, portable type. (measurement item: Wheel profile, diameter, clearance, etc.)~~
 - ~~ff. 1 set: Wheel load measuring devise, portable type. (Load cell unit, Rail set, Power unit, etc.)~~
 - gg. 149Sets: Laptop Computer (Minimum indicative specifications RAM: ~~4GB~~ 8GB, ~~HDD~~ SDD: ~~320GB~~ 500GB, ~~13.3"~~ 15.6" Display, OS: MS Windows 10 or latest version, Software: MS Office professional latest version)
3. Eligible Supplier

There is no preference.

N71.03 Special Equipment and Tools

1. Quantity: One (1) lot

The following special tools shall be supplied, but not limited to;

- a. Wheel measurement devices, portable, non-contact type: 4 sets
- b. Wheel measurement devices, portable, full contact type: 4 sets
- c. Wheel load measuring device, portable type (system for 4 axles): 2 sets
- d. Real time wheel geometry measurement system: 1 set
- e. On-board Signal equipment tester: 4 sets
- f. On-board Telecommunication equipment tester: 4 sets
- g. Re-writing devices for internal, external and public address display systems: 4 sets
- h. Disc Brake replacing tool: 4 sets
- i. Handheld thermal imaging cameras: 4 sets
- j. Shock pulse and Vibration analyzers for machines: 2 sets
- k. Special tools for removal and installations of coach doors: 8 sets
- l. Motor disassembling/reassembling tools: 4 sets
- m. Bogie disassemble/reassemble special tools: 4 sets
- n. Special tools for air conditioner overhaul: 4 sets
- o. High voltage insulation tester: 2 sets
- p. Contactor and High-Speed Circuit Breaker (HSBC) tester: 1 set
- q. Solenoid valve test bench: 1 set
- r. Relay tester: 1 set
- s. Door operating device tester: 4 sets
- t. Speed sensor tester: 2 sets
- u. Electronic Worktables with ESD protection: 10 sets
- v. Soldering and de-soldering stations: 10 sets
- w. Multipurpose Power Supplies: 10 sets
- x. Digital Storage Oscilloscopes: 10 sets
- y. Special tools for Air-spring overhaul: 4 sets
- z. Special tools for Damper overhaul: 4 sets
- aa. Special tool for Draft gear: 4 sets
- bb. Brake valve test bench: 1 set
- cc. Special tools for air valve overhaul: 2 sets
- dd. Special tools for Compressor overhaul: 2 sets
- ee. Handheld battery-operated Oscilloscope with DMM and Power analyzer: 2 sets

2. Functional Requirements: Tools/equipment/facilities for Rolling stock maintenance that is assumed not to be procured at general commercial markets are treated as special tools and test equipment of the Railway system and Rolling stock. Special tools and test equipment are to be planned and supplied in close consultation and interfacing with Rolling Stock supplier and other Railway systems vendors at appropriate time with approval of Engineer.

2.1. Actual requirement and specifications shall be reviewed and finalized as per the maintenance requirement of the Rolling stock on NSCR.

2.2. Design: Indicated specifications below are for reference only and actual design and specifications may vary and depend upon final Rolling stock design and maintenance requirement.

- a. Wheel measuring devices, portable type, non-contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement, etc.

- i. Portable device consists of equipment for precise measuring of the entire wheel that uses laser to complete without contact.
 - ii. The sensor consists of multiple lasers and is housed in an appropriate IP casing that is connected to a computer/tablet PC unit when taking the measurements. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the CMMS.
 - iii. RS identification (train, car, bogie, wheel location, date and technician ID's) can be input as related measurements.
 - iv. Reference standards shall be provided for automatic re-calibration.
- b. Wheel measuring devices, portable type, full contact type. Measurement items are: Wheel profile, Wheel diameter, Back to back measurement, and clearances, Wheel defect, Tyre thickness, Radial and axial run out measurements, Brake disc profile measurement etc.
 - i. Portable device consists of equipment for precise measuring of the entire wheel that uses full contact measurement system with optical encoders and Bluetooth/WiFi connectivity for data transmission to PDA/Tablet.
 - ii. Measurements and data storage capacity shall be recorded for download via USB and can be integrated to the CMMS.
 - iii. Reference standards shall be provided for automatic re-calibration.
- c. Wheel load measuring device, portable type (system for 4 axles)
 - i. Portable contact force measuring each wheel load of one EMU (8wheel/car) at the same time to confirm the wheel load distribution and deviation required by the EMU maintenance manual are to be within acceptable range.
 - ii. Measurement results shall be recorded and indicated in the panel with alarm when load deviation exceeds the range. Result of each car shall be consolidated into one data file for one train and stored in the system, can download via USB and can be integrated to CMMS.
 - iii. The system shall be installed in the entrance rails of the Final Adjustment Shop and Unscheduled Repair Shop and design shall consider self-propulsive condition of EMU such as the effect of return current.
 - iv. It shall be designed for bogie distance of 13,800mm, wheel base 2,100mm and axle load max. approx. 16 tons.
 - v. Measurement shall be capable on stopping condition with accuracy shall be within +/- 500mm. One axle measurement shall be possible.
 - vi. Close interface shall be taken with Rolling Stocks contractors to confirm design and performance conditions.
- d. Real time wheel geometry measurement system
 - i. The system is for contactless automatic measurement of geometrical parameters of railway wheels and uses a combination of 2D/3D laser scanners, mounted wayside in the track area.
 - ii. The system is intended to perform the following but not limited to;
 - iii. Vehicle detection and identification – to detect train and identify train number.
 - iv. Wheel Profile Measuring – to measure wheel profile and derived parameters (flange height, flange thickness, flange slope, root wear, wheel tread hollow, wheel flatness, wheel rim thickness, flange rollover, tread rollover, wheel diameter, wheel width, back-to-back distance etc.)
 - v. All measurement readings for all the wheels are sent through Ethernet to control computer for profiles reconstruction and dimensions calculations. Finally, all the data are collected in the host depot computer in wheel sets wear database and

- linked to CMMS servers/workstation in Depot. Data shall be available and can be linked in NSRP depots.
- vi. Close interface shall be taken with all systems in NSRP lines.
 - vii. Calibration tools shall be part of the contractor to supply.
- e. On-board Signal equipment tester – system used to test on board signaling equipment while on-board train and or station. Precision handheld RF transmission lines and antenna tester return loss/SWR and fault location measurement instrument, with frequency coverage. Close interface shall be taken with necessary interfacing parties for design and performance conditions.
 - f. On-board Telecommunication equipment tester- system used to test on board Telecommunication equipment while on-board train and or at station. Close interface shall be taken with necessary interfacing parties for design and performance conditions.
 - g. Re-writing devices for internal, external and public address display systems - Portable handheld devices to diagnose, modify and monitor the functional data and software of various display systems in the rolling stock to suit the operational and maintenance requirements. Close interface with interfacing parties for design and performance conditions.
 - h. Disc Brake replacing tool – They shall be used to utilize maintenance for disc brake unit. Shall be composed but not limited to: (i.e. Hydraulic press assembly, pin guide, jigs, special wrenches, set of wrenches). Close interface shall be taken with Rolling Stock contractors for design and performance conditions.
 - i. Handheld thermal imaging cameras – Uses thermal imaging to locate electrical, mechanical problems, hot spots and other heat issues before they turn into costly failures & production downtime or electrical fires. It shall be used for thermal scanning of electrical circuits, panel boards, components, motor control cabinets, breaker panels for non-contact thermal images and temperature measurements to assess equipment and circuit conditions. IR Resolution – 172,800 pixels (480 × 360), Remote Control and Streaming Video via Wi-Fi. Accuracy – Calibrated within +/- 2°C or +/- 2% of reading, Temperature range -40°C to 650°C, Thermal sensitivity <0.04°C at 30°C, Digital Zoom 4X Continuous or better, Image Storage 1000 radiometric JPEG images (SD card memory), Focus- Manual or Automatic (one shot). Accessories shall include: SD Memory Card, 100-260V AC adaptor/charger, two Li-Ion rechargeable batteries, 2-bay battery charger, power supply (with multi-plugs), Software, USB cable, video cable, Bluetooth® headset, lens cap, neckstrap, and hard case.
 - j. Shock Pulse Meter and Vibration Analyzer for rotating machines: - Shock Pulse Meter (SPM) cum Vibration analyser is a handheld device for a fast, easy, and reliable diagnosis of the operating condition of rolling element bearings of traction and other auxiliary motors of Rolling stock. It shall provide easy-to-understand condition evaluation in a green-yellow-red scale, as well as crystal-clear spectrums and time signals for further analysis. Basic features are as follows: Three channel simultaneous vibration monitoring. Frequency range DC to 40 kHz, Dynamic range >100 dB, 24 bit AD, Up to 25600 line FFT spectrum, Pre-fault symptoms for spectrum analysis, Simultaneous recording for up to 50 hours, Enveloping, true zoom, synchronous measurement, Stroboscope input/output for rpm measurement, Download thousands of measuring points, Current and voltage input, 0 –20 mA / 0 –10 V, Motor current analysis, Speed measurements 1– 120 000 rpm, Stethoscope function, earphones, 4.3” TFT colour display with automatic back light, Programmable function keys, One hand

operation, right or left, Accepts IEPE standard vibration transducers, Carbon-fiber-reinforced enclosure, IP65.

- k. Special tools for removal and installations of coach doors – shall be provided to enable door leaf removal and installation from/to the vehicles. Shall be designed to be used with overhead crane, forklift and pallet carrier. Close interface shall be taken with Rolling Stock contractors and NS-01 contractor for the design and performance conditions.
- l. Motor disassembling/reassembling tools – they shall be used for dismantling and reassembling tool of traction motor. Shall be composed but not limited to:
 - i. Alignment check tool used to indicate displacement of traction motor and gear unit.
 - ii. Pinion heater to enable installation of bearing by expansion.
 - iii. Bearing puller and pusher tools.
- m. Bogie disassemble/reassemble special tools – they shall be used to disassemble and reassemble bogies for maintenance utilization and shall be composed of the following but not limited to:
 - i. Go No type gauges for important bogie frame dimensions and clearances.
 - ii. Lifting tool for bogie frame, traction motor and radius arm. Also to include lifting tool for air spring and wheelset.
 - iii. Tool for setting primary spring (e.g. primary spring press for bogie assembly, gauge for wheelbase and parallelism of axles and stand for axle box)
 - iv. Caster for gear box to allow smooth movement in workshop of wheel set.
 - v. Close interface shall be taken with Rolling Stocks contractors and NS-01 contractor for design and performance conditions.
- n. Special tools for Air Conditioner Unit (ACU) overhaul – the system shall be used to lift ACU and ACU evaporator cover to utilize maintenance. Shall composed of but not limited to:
 - i. Air conditioning unit and cover lifting beams
 - ii. Air conditioning storage rack
 - iii. Items shall be cross checked to N18 Air Conditioner Shop equipment
 - iv. Close interface shall be taken with Rolling Stocks contractors and NS-01 contractor for design and performance conditions.
- o. High Voltage Insulation Tester – is a device performs insulation resistance testing up to 10 kV. The Insulation Resistance (IR) test is a quantitative test, which indicates the effectiveness of a product’s electrical insulation. Applications include cables, transformers, motors, circuit breakers and bushings. Common insulation tests are the “spot test”, a 1-minute IR test and a 10-minute Polarisation Index (PI) test, where PI is the ratio R_{10min} / R_{1min} and is temperature independent. Basic features of the device shall be as follows but not limited to:- Automatic insulation resistance testing polarisation index (PI), dielectric absorption ratio (DAR), step voltage (SV) dielectric discharge (DD) and a ramp test, Insulation test voltages from 50 V to 10 kV for maximum flexibility, Insulation resistance measurement up to $20 T \Omega$, Guard terminal function available to eliminate surface current effect, High charge current available for measurement of inductive loads, High noise immunity, optical isolation between the operator and the HV circuit, Diagnostic functionality, Rechargeable battery and a.c. mains operation, On-board test result storage, 10 kV isolated USB interface to make real time downloading of test data and stored information to asset management software, Accessories double insulated 10 KV clip lead set with clamps in 5, 10, 15 m

length, a transport case to store device along with standard lead sets. Ingress protection class IP 65.

- p. Contactor and High-Speed Circuit Breaker (HSCB) tester – the system shall be used to maintenance for contactors and HSCB. The system shall measure but not limited to:
 - i. Contact timing test, contact travel characteristics for speed, contact gap, over travel, bounce etc., Static and dynamic resistance measurement, records trip/close , holding coil current measurement, separate timing channels for measurement of auxiliary contact, Analog measurement channels for travel transducers or general voltage/current measurements, programming the current wave form and checking tripping or the circuit breaker in different test conditions. USB interface for communication with a PC. Inbuilt printer for test results.
 - ii. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.
- q. Solenoid valve test bench – indicative tests to be performed on rolling stocks shall be: Proof Pressure Test, Seat Leak Test, Reverse Seat Leak Test, Coil Voltage Test, Coil Current Test, High Frequency Cycling, Coil Resistance or Impedance Test, Port Flow Test, Self-Test. Interchangeable valve adapters to be provided to permit multiple valve models to be tested on a single machine. A PLC controlled with graphical colour touch screen operator interface for easy operation and operator training to be provided. Test data logging, network interface, bar code scanning and part marking shall be included. Safety features to include light curtain guards, dual hand switches, pressure relief valves and explosion shields if required.
- r. Relay tester – Portable relay test system design to facilitate rapid verification of various Rollick stock relay condition. The system is battery powered (lasts 8 hours standard use) and allows the operator to perform tests on both instantaneous and timer relays. Efficiently determine correct relay functionality including minimum operating voltage, contact quality and delay times. Defects such as jammed contacts are identified. Easy and quick operation: insert relay, select coil voltage, contact current and delay mode (timer relays only). After pressing start button within 3 seconds relay tester shows pass/fail result by a green/red LED. Including contact wetting possibility to electrically clean relay contacts the system shall be used to test relays functionality, confirming relay operation and targets during normal fault clearing conditions. All measurements shall be able record or can be downloaded via USB. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.
- s. Door operating device tester – the system shall be used to confirm set values of obstacle detection is within allowed range. This can be ranges of obstacle detection test bars. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.
- t. Speed sensor tester: It consists of two test modules. One module is a portable PDA/Tablet based field unit and other is a Test room bench. Its function is to test and calibrate various speed sensors/ pulse generators of the Rolling stock used for sensing train speeds. The field tester is used for testing and calibration of speed sensor/pulse generator on board train. By using keypad, it generates the pulses by programming various parameters like wheel diameter (WD), Pulses Per Revolution (PPR), Acceleration and KMPH as per requirement. 110 V DC supply of EMU can be used as power source to field tester and provision of suitable connector with cable set are provided. The test room bench shall be micro-processor/PLC based panel for simulation, testing and calibration of all speed sensors/ pulse generators of the Train.

The system shall work in three modes i.e. Auto mode, Manual mode, PC mode. To test and calibrate sensor/pulse generator, test panel shall have following features.

- i. DC drive with high torque DC Motor with Variable speed drive control.
 - ii. Digital RPM Counters.
 - iii. Two modes of speed selections Fine and Coarse.
 - iv. Sensor/PG Fixation base.
 - v. Variable 0-150 V dc power supply.
 - vi. Calibration, recording of speed and acceleration calibration data in the PC with suitable interface. Suitable interfacing shall be done with Rolling stock and Signaling contractors to obtain design feature of train speed sensors.
- u. Electronic Worktables with ESD protection – the system is used for repair of the Electrostatic Sensitive Devices which is undertaken in an Electrostatic Discharge Protected Area (EPA). These special purpose workstations are part of EPA and helps in preventing any static build up that could damage the component being handled / repaired. Every surface of the EPA workstation, that the ESD could come into contact with, is conductive and is earthed. This will include a footwear test and a wristband test, which will have dedicated testing stations for ease of use. Cleaning of the components may be undertaken using a dedicated cleaning station, which may form part of the EPA workstation. Following accessories will be part of the EPA workstation kit: Cleaning wipes, Spare wristbands, Conductive chair, Ionised air gun, Power unit, Storage shelf, Antistatic workbench, Draw unit, Top shelf, Wrist strap test point, Footwear test station, Lab coat, Anti-static work boots, Heel clips, Field Service Kit, Trolley Anti-static bag (0.1m²), Anti-static bag (0.5m²), Conductive transit box (0.15m²), Conductive transit box (0.35m²).
 - v. Soldering and de-soldering stations – are benchtop machines with controls for adjusting heat setting to suit workpieces and one of more hand pieces to handle solder. This must be a dual purpose 2 in 1 soldering and de-soldering station with PID based programmable temperature control features.
 - w. Multipurpose Power Supplies: Regulated AC/ DC voltage and current power supplies required for trouble shooting and repair of electronic items and PCB cards of Rolling stock equipment. These are to be used on the Electronic worktables in the Electrostatic Discharge Protected Area (EPA) in the Electronic shop. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.
 - x. Digital Storage Oscilloscopes – the device shall be used to measure various system signals from high voltage to ultra low voltage simultaneously. Generate and record waveforms with a single unit. It shall have following features but not limited to: Bandwidth: 200 MHz with 2 GS/s sampling rate. Record length 5M on all channels. Up to 4 analog channels 32 automated measurements with FFT function for quick waveform analysis. Output previously recorded problematic waveforms and apply to devices under test to simulate potential issues. Large capacity memory. 200 MHz, 10x passive probe (one per analog channel), USB, LAN and Wi-Fi interface, standard calibration certificate.
 - y. Special tools for Air-spring overhaul – These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of Air springs on the rolling stock bogies.

- z. Special tools for Damper overhaul: - These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of dampers on the rolling stock bogies.
- aa. Special tool for Draft gear: - These consist of any special tools, jigs and fixtures required for dismantling, repairs, overhaul, testing and reassembly of Draft gears on the rolling stock cars.
- bb. Brake valve test bench – the system is to measure the performance of the various brake and other valves of the rolling stock pneumatic system.
 - i. System is to measure test item (i.e. brake control unit, electro-pneumatic change relay valve, variable load valve, bypass check valve, reducing valve, levelling valve, differential pressure valve, pressure switch and safety valves etc.). Actual type of valves to be tested and their test requirement will depend upon pneumatic system design on the Rolling stock.
 - ii. Test equipment is controlled by programmable logic controller (PLC) and the control equipment. Operation and the display are controlled by touch panel display.
 - iii. Close interface shall be taken with Rolling Stocks contractors for design and performance conditions.
 - iv. Suitable USB, LAN and WIFI connectivity to be provided for data connectivity to CMMS workstations and server.
- cc. Special tools for air valve overhaul: - They should cover all special tools, jigs and fixtures required for dismantling, repair, overhaul, testing and reassembly on the rolling stock.
- dd. Special tools for compressor overhaul – they shall be used to utilize for maintenance of air compressor and shall be composed but not limited to:
 - i. Dial gauge, test indicator, taper gauge and special base holder
 - ii. Special hexagon wrench, gear wrench, torque wrench
 - iii. Special head for torque wrench, grease gun, bearing puller
 - iv. Compressor suspension jig (with eyebolt and mounting bolt)
 - v. Motor bearing insert jig and bearing heater
 - vi. Valve lapping arrangement.
 - vii. Close interface shall be taken within Rolling stock contractors for the design and performance conditions.
- ee. Handheld battery-operated Oscilloscope with DMM and power analyzer functions – the system shall be used for electrical and power electronics measurements. It shall combine a full featured real-time oscilloscope with a True RMS digital multimeter in rugged, battery-operated instruments. Scope and meter modes can operate simultaneously and independently on the same or separate signals. Basic features are as follows but not limited to:
 - i. It shall allow testing and verifying correct operation of motors, efficiency, verifying power supply performance and measuring the effect of neutral current.
 - ii. It shall have dual channel 100 MHz dual channel oscilloscope function to enable troubleshooting and verification of electronic control circuits.
 - iii. It shall be able to measures Harmonics up to 31st (Fundamental from 30 Hz to 450 Hz)
 - iv. Automatic Power Measurement with Statistics
 - v. Advanced Trigger – Delay, Pulse, Video (Line Count and Field Select), PWM Motor Drive

- vi. Accessories shall include but not limited to tough case and 1 kV High-voltage Probes.

3. Eligible Supplier

There is no preference.

END OF PART A OF APPENDIX 8.1

No	Line	Station Name	Station Type	PSD Type	Sets	Doors
16	NSRP-South	Tutuban	Elevated	Half-height	2	64
17	NSRP-South	Blumentritt	Elevated	Half-height	4	128
18	NSRP-South	Espana	Elevated	Half-height	2	64
19	NSRP-South	Santa Mesa	Elevated	Half-height	2	64
20	NSRP-South	Paco	Elevated	Half-height	4	128
21	NSRP-South	Buendia	Elevated	Half-height	4	128
22	NSRP-South	EDSA	At Ground	Half-height	2	64
23	NSRP-South	Nichols	At Ground	Half-height	2	64
24	NSRP-South	FTI	At Ground	Half-height	2	64
25	NSRP-South/ MMSP	Bicutan	Elevated	Half-height	4	128
26	NSRP-South	Sucat	Elevated	Half-height	4	128
27	NSRP-South	Alabang	Elevated	Half-height	4	128
28	NSRP-South	Muntinlupa	Elevated	Half-height	2	64
29	NSRP-South	San Pedro	Elevated	Half-height	4	128
30	NSRP-South	Pacita	Elevated	Half-height	2	64
31	NSRP-South	Binan	Elevated	Half-height	2	64

No	Line	Station Name	Station Type	PSD Type	Sets	Doors
32	NSRP-South	Santa Rosa	Elevated	Half-height	4	128
33	NSRP-South	Cabuyao	Elevated	Half-height	4	128
34	NSRP-South	Banlic	Elevated	Half-height	2	64
35	NSRP-South	Calamba	Elevated	Half-height	4	128
Total					98	3136

The Contractor shall study the track alignment drawings and include in the design for curved platforms.

In the MCRP depot, the HH PSD of 2 car length (total 8 ASDs) shall be provided for training purpose. This shall be operational equipped with all the features and controls same as in the station.

- (2) PSD system shall include but shall not be limited to:
 - a) Automated sliding screen doors of transparent glass type complete with fixed screen panels, emergency escape doors, platform end doors, threshold plate, rubber static gap filler to form a fully enclosed barrier along the platform.
 - b) Entry/Exit doors for driver's cab and platform end doors for access from/to the tracks
 - c) Appropriate individual and integrated control and monitoring system for driver and station staff.
 - d) Safety System with sensors, alarms and indicators
 - e) Passenger detection system within the gap between the train and the PSD
 - f) Power supply system with appropriate backup
 - g) Power supply, control and monitoring cables with appropriate cable rack or cable duct among facilities.
 - h) Structural frame and fixing accessories
 - i) Decoration board harmonized with the station design.
- (3) The Contractor shall submit proposal for system configuration for PSD systems in accordance with the Employer's Requirements to the Engineer for Approval. The proposal includes non-documents such as material samples and prototypes.

10.1.5 Full-height PSD system

- (1) Full-height PSD system shall include structural frame, sliding screen door, emergency door, fixed screen, entry/exit screen doors for driver's cab, device for door opening in emergency at each car end, sensors, control/monitoring system, alarms, sign, power supply and other necessary facilities.

No	Line	Station Name	Station Type	PSD Type	Sets	Doors
16	NSRP-South	Tutuban	Elevated	Half-height	2	64
17	NSRP-South	Blumentritt	Elevated	Half-height	4	128
18	NSRP-South	Espana	Elevated	Half-height	2	64
19	NSRP-South	Santa Mesa	Elevated	Half-height	2	64
20	NSRP-South	Paco	Elevated	Half-height	4	128
21	NSRP-South	Buendia	Elevated	Half-height	4	128
22	NSRP-South	EDSA	At Ground	Half-height	2	64
23	NSRP-South	Nichols	At Ground	Half-height	2	64
24	NSRP-South	FTI	At Ground	Half-height	2	64
25	NSRP-South/ MMSP	Bicutan	Elevated	Half-height	4	128
26	NSRP-South	Sucat	Elevated	Half-height	24	64 <u>128</u>
27	NSRP-South	Alabang	Elevated	Half-height	4	128
28	NSRP-South	Muntinlupa	Elevated	Half-height	2	64
29	NSRP-South	San Pedro	Elevated	Half-height	4	128
30	NSRP-South	Pacita	Elevated	Half-height	2	64
31	NSRP-South	Binan	Elevated	Half-height	2	64

No	Line	Station Name	Station Type	PSD Type	Sets	Doors
32	NSRP-South	Santa Rosa	Elevated	Half-height	24	64 128
33	NSRP-South	Cabuyao	Elevated	Half-height	4	128
34	NSRP-South	Banlic	Elevated	Half-height	2	64
35	NSRP-South	Calamba	Elevated	Half-height	4	128
Total					98	3136

The Contractor shall study the track alignment drawings and include in the design for curved platforms.

In the MCRP depot, the HH PSD of 2 car length (total 8 ASDs) shall be provided for training purpose. This shall be operational equipped with all the features and controls same as in the station.

- (2) PSD system shall include but shall not be limited to:
 - a) Automated sliding screen doors of transparent glass type complete with fixed screen panels, emergency escape doors, platform end doors, threshold plate, rubber static gap filler to form a fully enclosed barrier along the platform.
 - b) Entry/Exit doors for driver's cab and platform end doors for access from/to the tracks
 - c) Appropriate individual and integrated control and monitoring system for driver and station staff.
 - d) Safety System with sensors, alarms and indicators
 - e) Passenger detection system within the gap between the train and the PSD
 - f) Power supply system with appropriate backup
 - g) Power supply, control and monitoring cables with appropriate cable rack or cable duct among facilities.
 - h) Structural frame and fixing accessories
 - i) Decoration board harmonized with the station design.
- (3) The Contractor shall submit proposal for system configuration for PSD systems in accordance with the Employer's Requirements to the Engineer for Approval. The proposal includes non-documents such as material samples and prototypes.

10.1.5 Full-height PSD system

- (1) Full-height PSD system shall include structural frame, sliding screen door, emergency door, fixed screen, entry/exit screen doors for driver's cab, device for door opening in emergency at each car end, sensors, control/monitoring system, alarms, sign, power supply and other necessary facilities.

Particular Conditions (PC)

Part A - Contract Data

Conditions	Sub-Clause	Data
Employer's name and address	1.1.2.2 & 1.3	Department of Transportation (DOTr). Pinatubo Street, corner Sergio Osmeña Sr. Street, Clark Freeport Zone, Angeles City, Pampanga, 2009 Philippines
Engineer's name and address	1.1.2.4 & 1.3	GCR Consortium, 20 th and 21 st Floor, Greenfield Tower, Mayflower Street, Greenfield District, 1500 Mandaluyong City, Metro Manila, Philippines
Bank's name	1.1.2.11	Japan International Cooperation Agency (JICA)
Borrower's name	1.1.2.12	The Government of the Republic of the Philippines
Time for Completion	1.1.3.3	Time for Completion (including Integrated System Testing, attendance on Performance Testing and Test Run by Rolling Stock Contractors, and assistance on Trial Operation by Operator): Section 1: 37 months: Acceptance of the Platform Screen Door system for Section 1 certified as Substantially Complete, Section 2: 40 months: Completion of the whole of works for Section 2, Section 3: 48 months: Completion of the whole of works for Section 3, Section 4: 76 months: Completion of the whole of works for Section 4 including attendance on Rolling Stock for performance proving. The Contractor shall provide attendance on NS-02 and NS-03 Rolling Stock

		Contractors for performance testing. This amounts to 76 months for the whole of the Works. Refer to Table: Summary of Section below. Furthermore, the Contractor is required to achieve elements of the Works by Key Dates specified in the Attachment 1 to Particular Conditions Part A Contract Data.
Defects Notification Period	1.1.3.7	Two (2) Years per Section / Sub-section
Sections	1.1.5.6	Refer to Table: Summary of Sections below.
Electronic transmission systems	1.3	All correspondence/submissions of any nature between the Contractor and the Engineer shall be transmitted via an Electronic Document Management System (EDMS) selected by the Employer (see Employer's Requirements for more details). <i>[Insert Contractor's name and address.]</i>
Governing Law	1.4	The Laws of the Republic of the Philippines
Ruling language	1.4	English
Language for communications	1.4	English
Time for access to, and possession of, all parts of the Site	2.1	The Employer shall give the Contractor right of access to, and/or occupation of the Site in accordance with the schedule described in Attachment-2 to Particular Conditions Part A Contract Data. Access will be given by Section / Sub-section.
Engineer's Duties and Authority	3.1(B)(ii)	Variations resulting in an increase of the Accepted Contract Amount in excess of one percent (1%) shall require approval of the Employer.
Performance Security	4.2	The Performance Security will be in the form of one "demand guarantee" for ten percent (10 %) of the Accepted Contract Amount and for the same currencies and proportion as the Accepted Contract

Particular Conditions (PC)

Part A - Contract Data

Conditions	Sub-Clause	Data
Employer's name and address	1.1.2.2 & 1.3	Department of Transportation (DOTr). Pinatubo Street, corner Sergio Osmeña Sr. Street, Clark Freeport Zone, Angeles City, Pampanga, 2009 Philippines
Engineer's name and address	1.1.2.4 & 1.3	GCR Consortium, 20 th and 21 st Floor, Greenfield Tower, Mayflower Street, Greenfield District, 1500 Mandaluyong City, Metro Manila, Philippines
Bank's name	1.1.2.11	Japan International Cooperation Agency (JICA)
Borrower's name	1.1.2.12	The Government of the Republic of the Philippines
Time for Completion	1.1.3.3	<p>Time for Completion (including Integrated System Testing, attendance on Performance Testing and Test Run by Rolling Stock Contractors, and assistance on Trial Operation by Operator):</p> <p>Section 1: 37 months: Acceptance of the Platform Screen Door system for Section 1 certified as Substantially Complete,</p> <p>Section 2: 37<u>40</u> months: Completion of the whole of works for Section 2,</p> <p>Section 3: 48 months: Completion of the whole of works for Section 3,</p> <p>Section 4: 79<u>76</u> months: Completion of the whole of works for Section 4 including attendance on Rolling Stock for performance proving.</p> <p>The Contractor shall provide attendance on NS-02 and NS-03 Rolling Stock</p>

		Contractors for performance testing. This amounts to 79 <u>76</u> months for the whole of the Works. Refer to Table: Summary of Section below. Furthermore, the Contractor is required to achieve elements of the Works by Key Dates specified in the Attachment 1 to Particular Conditions Part A Contract Data.
Defects Notification Period	1.1.3.7	Two (2) Years per Section / Sub-section
Sections	1.1.5.6	Refer to Table: Summary of Sections below.
Electronic transmission systems	1.3	All correspondence/submissions of any nature between the Contractor and the Engineer shall be transmitted via an Electronic Document Management System (EDMS) selected by the Employer (see Employer's Requirements for more details). <i>[Insert Contractor's name and address.]</i>
Governing Law	1.4	The Laws of the Republic of the Philippines
Ruling language	1.4	English
Language for communications	1.4	English
Time for access to, and possession of, all parts of the Site	2.1	The Employer shall give the Contractor right of access to, and/or occupation of the Site in accordance with the schedule described in Attachment-2 to Particular Conditions Part A Contract Data. Access will be given by Section / Sub-section.
Engineer's Duties and Authority	3.1(B)(ii)	Variations resulting in an increase of the Accepted Contract Amount in excess of one percent (1%) shall require approval of the Employer.
Performance Security	4.2	The Performance Security will be in the form of one "demand guarantee" for ten percent (10 %) of the Accepted Contract Amount and for the same currencies and proportion as the Accepted Contract

Table: Summary of Sections

<u>Section Name/Description</u> (Sub-Clause 1.1.5.6)	<u>Time for Completion</u> (Sub-Clause 1.1.3.3)	<u>Damages for Delay</u> (Sub-Clause 8.7)
<u>Section 1:</u> Platform Screen Door (PSD) and related works at the stations of the North- South Commuter Railway Project (Malolos-Tutuban) (NSCR). <u>Approximately length of NSCR, 37.6km and 9 stations.</u>	<u>Thirty-Seven (37) months for the whole of the works for Section 1 certified as Substantially Complete. [To be finalized referring to the NSCR' schedule]</u>	Five hundredths of a percent (0.05%) of the corresponding Amount of Section 1* per day for the completion of the whole of works for Section 1 and for delay in achieving each Key Date for the respective elements of the Works.
<u>Section 2:</u> the Malolos Clark Railway Project (MCRP). <u>Approximately length of MCRP, 50.5 km and 6 stations including the north depot.</u>	<u>Forty (40) months for the whole of the works for Section 2 excluding attendance on NS-02 and NS-03 contractors for performance testing of on-board equipment</u>	Five hundredths of a percent (0.05%) of the corresponding Amount of Section 2* per day for the completion of the whole of works for Section 2 and for delay in achieving each Key Date for the respective elements of the Works.
<u>Section 3:</u> Section between NSCR stations (Solis exclusive) and Blumentritt and Tutuban stations (inclusive) of the Malolos Clark Railway Project- (Blumentritt Extension) (MCRP-Ext.). <u>Approximate length of 6.479 km and 2 stations.</u>	<u>Forty-Eight (48) months) for the whole of the works for Section 3.</u>	Five hundredths of a percent (0.05%) of the corresponding Amount for Section 3* per day for the completion of the whole of works for Section 3 and for delay in achieving each Key Date for the respective elements of the Works.
<u>Section 4:</u> Section between Blumentritt station (exclusive) and Calamba station (inclusive) of the North South Railway Project-South Line (Commuter) (NSRP-South). <u>Approximately length of 54.6 km and 18 stations including the south depot.</u>	<u>Seventy-Six (76) months for the whole of the works for Section 4 and the whole of the Works excluding attendance on NS-02 and NS-03 Contractors for performance testing of on-board equipment</u>	Five hundredths of a percent (0.05%) of the corresponding Amount for Section 4* per day for the completion of the whole of works for Section 4 and for the completion of the whole of the Works, and for delay in achieving each Key Date for the respective elements of the Works.
Attendance on the Rolling Stock Contractors NS-02 and NS-03 will be required between months 37 to 76. Provided that there are no delays attributable to the NS-01 Contractor from the respective contract programs for Integrated Testing and Commissioning, Trial Operation and performance testing, no damages will be payable by the NS-01 Contractor. If the NS-01 Contractor is culpable, then damages as given above will be payable for each day of delay.		

Note: * The Amount for each Section will be the Accepted Contract Amount multiplied by the percentage for each Section as given in Contract Data Sub-Clause 14.9.

Table: Summary of Sections

<u>Section Name/Description</u> <u>(Sub-Clause 1.1.5.6)</u>	<u>Time for Completion</u> <u>(Sub-Clause 1.1.3.3)</u>	<u>Damages for Delay</u> <u>(Sub-Clause 8.7)</u>
Section 1: Platform Screen Door (PSD) and related works at the stations of the North- South Commuter Railway Project (Malolos-Tutuban) (NSCR). <u>Approximately length of NSCR, 37.6km and 9 stations.</u>	<u>Thirty-Seven (37) months for the whole of the works for Section 1 certified as Substantially Complete. [To be finalized referring to the NSCR' schedule]</u>	Five hundredths of a percent (0.05%) of the corresponding Amount of Section 1* per day for the completion of the whole of works for Section 1 and for delay in achieving each Key Date for the respective elements of the Works.
Section 2: the Malolos Clark Railway Project (MCRP). <u>Approximately length of MCRP, 50.5 km and 6 stations including the north depot.</u>	Thirty-Seven <u>Forty (3740) months for the whole of the works for Section 2 excluding attendance on NS-02 and NS-03 contractors for performance testing of on-board equipment</u>	Five hundredths of a percent (0.05%) of the corresponding Amount of Section 2* per day for the completion of the whole of works for Section 2 and for delay in achieving each Key Date for the respective elements of the Works.
Section 3: Section between NSCR stations (Solis exclusive) and Blumentritt and Tutuban stations (inclusive) of the Malolos Clark Railway Project- (Blumentritt Extension) (MCRP-Ext.). <u>Approximate length of 6.479 km and 2 stations.</u>	<u>Forty-Eight (48) months) for the whole of the works for Section 3.</u>	Five hundredths of a percent (0.05%) of the corresponding Amount for Section 3* per day for the completion of the whole of works for Section 3 and for delay in achieving each Key Date for the respective elements of the Works.
Section 4: Section between Blumentritt station (exclusive) and Calamba station (inclusive) of the North South Railway Project-South Line (Commuter) (NSRP-South). <u>Approximately length of 54.6 km and 18 stations including the south depot.</u>	Seventy-Nine-Six (7976) months for the whole of the works for Section 4 and the whole of the Works excluding attendance on NS-02 and NS-03 Contractors for performance testing of on-board equipment	Five hundredths of a percent (0.05%) of the corresponding Amount for Section 4* per day for the completion of the whole of works for Section 4 and for the completion of the whole of the Works, and for delay in achieving each Key Date for the respective elements of the Works.
Attendance on the Rolling Stock Contractors NS-02 and NS-03 will be required between months 37 to 7976 . Provided that there are no delays attributable to the NS-01 Contractor from the respective contract programs for Integrated Testing and Commissioning, Trial Operation and performance testing, no damages will be payable by the NS-01 Contractor. If the NS-01 Contractor is culpable, then damages as given above will be payable for each day of delay.		

Note: * The Amount for each Section will be the Accepted Contract Amount multiplied by the

ATTACHMENT 1

SUMMARY OF KEY DATES

[To be finalized prior to issuing the Bidding Documents.]

- (1) The Contractor requires that each element of work shall be achieved by Key Dates (KD). Delay in achieving Key Dates incurs Delay Damages as given in Part A Contract Data of Particular Conditions.
- (2) Achieving a Key Date means completing all works related to that portion to the satisfaction of the Engineer within working hours on the last day of the month specified below.
- (3) Month numbers show in the schedule signify the lapsed time in months from the Commencement Date. The month numbers will be converted into actual calendar dates after receipt by the Contractor of the Engineer's notification of the Commencement Date.
- (4) The Interface Contractor for the following Contract Packages with which the Works will be required to interface are as shown below:

The North South Commuter Railway Project (Malolos-Tutuban) (NSCR) (N1)

- Package CP 01 Elevated Structures, 6 Stations and Depot
- Package CP 02 Elevated Structures and 3 Stations
- Package CP 03 Rolling Stock, and
- Package CP 04 E&M Systems and Track Works
- Package CP 05 Elevated Structure and 1 Station

The Malolos-Clark Railway Project (MCRP)

- Package CP N-01 Building and Engineering Works for Approx.17Kms of Viaduct Structure including Station Buildings at Calumpit and Apalit
- Package CP N-02 Building and Engineering Works for Approx.16Kms of Viaduct Structure including Elevated Station Building at San Fernando
- Package CP N-03 Building and Engineering Works for Approx.12Kms of Viaduct Structure including Elevated Station Buildings at Angeles and Clark
- Package CP N-04 Building and Engineering Works for Approx.6.5Kms of Railway Track Structure including Underground Station at Clark International Airport and
- Package CP N-05 Building and Civil Engineering Works for North Depot Buildings including related infrastructure and Track Work Sub-Ballast

The Malolos-Clark Railway Project (Blumentritt Extension) (MCRP-Ext.)

- Package CP S-01 Building and Civil Engineering Works for approximately 1.2 km of Railway Viaduct Structure including Elevated Station at Blumentritt

The North South Railway Project-South Line (Commuter) (NSRP-South)

- Package CP S-02 Building and Civil Engineering Works for approximately 7.9 km of Railway Viaduct Structure including Elevated Stations at Espana, Santa Mesa and Paco

- Package CP S-03a Building and Engineering Works for approximately 7.9 km of at Grade and Viaduct Railway Track Structure including Elevated Station at Buendia, and at grade stations at EDSA and Senate
- Package CP S-03b Civil Engineering, Tunnel and Building Works for approximately 6.1 km of Railway with 4.7km of Underground Railway and 1.4km of at-Grade Railway, including FTI Station and Tunnelling Works to connect to MMSP Senate station
- Package CP S-03c Building and Engineering Works for Approximately 5.8 kms of Railway Viaduct Structure including Elevated Stations at Bicutan and Sucat
- Package CP S-04 Building and Civil Engineering Works for approximately 8.5 Kms of Viaduct Structure including 2 Station Buildings at Alabang and Muntinlupa
- Package CP S-05 Building and Civil Engineering Works for approximately 12.8 km of Viaduct Structure including 4 Station Buildings at San Pedro, Pacita, Binan and Santa Rosa
- Package CP S-06 Building and Civil Engineering Works for approximately 10.3 kms of Viaduct Structure and Approximately 1.4 Kms of Depot Access Line including 3 Station Buildings at Cabuyao, Banlic and Calamba
- Package CP S-07 Building and Civil Engineering Works for South Depot Buildings including related infrastructure and Trackwork Sub-Ballast.

The Malolos-Clark Railway Project (MCRP) and the North South Railway Project – South Line (Commuter) (NSRP-South):

- Package CP NS-02 Rolling Stock – Commuter Trainsets
- Package CP NS-03 Rolling Stock – Limited Express Trainsets

The Metro Manila Subway Project (MMSP):

- Package CP 101– Three Underground Stations, Tunnels and Depot
- Package CP 106 – Electromechanical Systems and Track Works
- Package CP 107 – Rolling Stock

Section 1: Platform Screen Door (PSD) and related works at the stations of the North- South Commuter Railway Project (Malolos-Tutuban) (NSCR).
(To be coordinated with GC of NSCR, NS Tren)

Key Date	Description	Month No.
KD 1-1	Achievement: Substantial Completion of installation of Platform Screen Doors and related works to commence Integrated Testing and Commissioning and Test Running using rolling stock in cooperation and coordination with NSCR N1 project CP 01, CP 02, CP 03 and CP 04 Contractors.	31
KD 1-2	Achievement: Attendance by NS-01 Contractor on the NSCR N1 project contractors to enable the NSCR N1 Contractors to hold the Integrated Testing and Commissioning and Test	34

	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 N1 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 stations.	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

KD 2-6	Achievement: Substantial Completion of Track Works and E&M Systems works to commence Integrated Testing and Commissioning and Test Running at Mainline using Rolling Stock procured under NSCR for full operation.	31
KD 2-7	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding) and all connections between MCRP and NSCR projects, including the Integrated Testing and Commissioning of MCRP and between MCRP and NSCR using rolling stock on the Mainline, at Stations and in the North Depot to allow the Employer with Contractors support to commence Trial Running. a) Between Solis and CIA stations using rolling stock supplied by NSCR N1 project b) Between Solis and CIA stations using rolling stock supplied by NS-02 contractor.	34 34
KD 2-8	Achievement: Completion of first tranche of Training using Contractor supplied facilities and training aids, and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals.	31
KD 2-9	Attendance on Rolling Stock Contractors NS-02 and NS-03 for performance proving of Rolling Stock and associated E&M systems for Taking Over by the Employer. a) NS-02 trainsets (trainsets 1 to 19) b) NS-03 trainsets (trainsets 1 to 7)	In accordance with the agreed schedules
KD 2-10	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Malolos and CIA Stations b) Between Solis and CIA Stations	37 37
KD 2-11	Achievement: Substantial Completion of installation and testing of workshop equipment and other apparatus in the North Depot.	37
Completion	Achievement: Completion of the whole of works for Section 2.	40

Section 3: Section between NSCR stations (Solis exclusive) and Blumentritt and Tutuban stations (inclusive) of the Malolos Clark Railway Project- (Blumentritt Extension) (MCRP-Ext.). Approximate length of 6.479 km and 2 stations.

Key Date	Description	Month No.
KD 3-1	KD 3-1.1 Achievement: Substantial Completion of Power Supply to achieve “Power On” at Blumentritt station.	43
	KD 3-1.2 Achievement: Substantial Completion of Power Supply to achieve “Power On” at Tutuban stations.	43
KD 3-2	Achievement: Substantial Completion of Track Works and E&M Systems works at MCRP-Ext from Blumentritt Station (inclusive) towards Solis Station and Tutuban station, allowing commencement of Integrated Testing and Commissioning and Test Running using rolling stock at Mainline from NS-02 / NS-03 or supplied by NSCR N-1 project in cooperation with NSCR CP 03 Contractor (as available).	44
KD 3-3	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding) and all connections between MCRP-Ext and NSCR projects from Blumentritt Station (inclusive) towards Solis Station and Tutuban Station to allow the Employer to commence Trial Running using rolling stock from NS-02 / NS-03 or supplied by NSCR N-1 project in cooperation with NSCR CP 03 Contractor (as available).	46
KD 3-4	Achievement: Completion of Training and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals	48
KD 3-5	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Blumentritt and Solis Stations & Blumentritt and Tutuban stations.	48
Completion	Achievement: Completion of the whole of works for Section 3.	48

Section 4: Section between Blumentritt station (exclusive) and Calamba station (inclusive) and the South Depot of the North South Railway Project-South Line (Commuter) (NSRP-South). Approximate length of 54.6 km and 18 stations including the South Depot.

Key Date	Description	Month No.
KD 4-1	Design collaboration with N-1 CP 03 Contractor of North-South Commuter Rail Project (Malolos-Tutuban) (NSCR), for signaling, Telecommunications and other on-board systems equipment.	12
KD 4-2	Design collaboration with Metro Manila Subway Project (MMSP), for signaling, Telecommunications and other on-board systems equipment.	12
KD 4-3	Achievement: Substantial Completion of Power Supply and Distribution at South Depot (S-07) to achieve “Power On”.	40
KD 4-4	Achievement: Substantial Completion of Power Supply at all stations to achieve “Power On”. <ul style="list-style-type: none"> a) From Espana Station to Paco Station (S-02) b) For Buendia Station to Nichols Station (S-03a) c) From FTI Station (S-03b) d) From Bicutan Station to Sucat Station (S-03c) e) For Alabang Station and Muntinlupa Station (S-04) f) From San Pedro Station to Santa Rosa Station (S-05) g) From Cabuyao Station to Calamba Station (S-06) 	61 61 75 75 40 40 40
KD 4-5	Achievement: Supply of On-board Equipment including all accessories and fittings at the premises of Rolling Stock Contractors in Japan during the months defined respectively (prior to indicative date) Key Date KD 4-5 is sub-divided as shown below:	
	KD 4-5.1: Supply to NS-02 Contractor for trainset 20	40
	KD 4-5.2: Supply to NS-02 Contractor for trainsets 21 to 25	44
	KD 4-5.3: Supply to NS-02 Contractor for trainsets 26 to 30	48
	KD 4-5.4: Supply to NS-02 Contractor for trainsets 31 to 35	52
	KD 4-5.5: Supply to NS-02 Contractor for trainsets 36 to 38	56
	KD 4-5.6: Supply to MMSP CP 107 Contractor for trainsets 1 to 2	16
	KD 4-5.7: Supply to MMSP CP 107 Contractor for trainsets 3 to 7	18

Key Date	Description	Month No.
	KD 4-5.8: Supply to MMSP CP 107 Contractor for trainsets 8 to 12	20
	KD 4-5.9: Supply to MMSP CP 107 Contractor for trainsets 13 to 17	22
	KD 4-5.10: Supply to MMSP CP 107 Contractor for trainsets 18 to 22	24
	KD 4-5.11: Supply to MMSP CP 107 Contractor for trainsets 23 to 27	26
	KD 4-5.12: Supply to MMSP CP 107 Contractor for trainsets 28 to 30	28
KD 4-6	Achievement: Substantial Completion of sufficient Track Works and related E&M System works in the South Depot to allow CP NS-02 and NS-03 Contractor(s) to stable the Rolling Stock and to carry out Testing and Commissioning of Rolling Stock at the South Depot.	37
KD 4-7	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 the South Depot and Mainline.	
	a) for Partial Operation	41
	b) for Full Operation	76
KD 4-8	Achievement: Substantial Completion of Track Works and E&M Systems works to allow CP NS-01 and CP NS-02 and CP NS-03 Contractors to commence Integrated Testing and Commissioning and Test Running at Mainline using rolling stock CP NS-02 and CP NS-03.	
	a) From Calamba to Alabang (Partial Operation)	41
	b) From Calamba to CIA (Full Operation)	76
KD 4-9	Achievement: Substantial Completion of the remaining Track Works and all related E&M System Works in the Depot to allow CP NS-02 Contractor to continue carrying out the assembling, testing and commissioning of Rolling Stock at the South Depot, in accordance with the agreed schedule between the Contractor and CP NS-02 Contractor and the Engineer.	In accordance with the agreed schedule
KD 4-10	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding), including the Integrated Testing and Commissioning using rolling stock, on the Mainline, at Stations and in Depot to allow the Employer with CP NS-01, CP NS-02 and CP NS-03 Contractors support to commence Trial Running using Rolling Stock.	
	a) Between Calamba and Alabang stations (Partial Operation)	

Key Date	Description	Month No.
	b) Between Calamba and CIA stations (Full Operation)	44 76
KD 4-11	Achievement: Completion of Training and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals.	41
KD 4-12	Attendance on Rolling Stock Contractors for performance proving of Rolling Stock and associated E&M systems for Taking Over by the Employer. a) NS-02 by trainset (20 to 38)	In accordance with the agreed schedule
KD 4-13	Achievement: Substantial Completion of installation and testing of workshop equipment and other apparatus in the South Depot.	76
Completion of the Works	Achievement: Completion of the whole of the Works for Section 4 and the whole of the Works except attendance on Rolling Stock Contractor for performance proving.	76
KD 4-14	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Calamba and Alabang Stations b) Between Calamba and CIA Stations	47 76
Completion of the Works	Achievement: Completion of the whole of works including attendance on Rolling Stock for performance proving.	76

ATTACHMENT 1

SUMMARY OF KEY DATES

[To be finalized prior to issuing the Bidding Documents.]

- (1) The Contractor requires that each element of work shall be achieved by Key Dates (KD). Delay in achieving Key Dates incurs Delay Damages as given in Part A Contract Data of Particular Conditions.
- (2) Achieving a Key Date means completing all works related to that portion to the satisfaction of the Engineer within working hours on the last day of the month specified below.
- (3) Month numbers show in the schedule signify the lapsed time in months from the Commencement Date. The month numbers will be converted into actual calendar dates after receipt by the Contractor of the Engineer's notification of the Commencement Date.
- (4) The Interface Contractor for the following Contract Packages with which the Works will be required to interface are as shown below:

The North South Commuter Railway Project (Malolos-Tutuban) (NSCR) (N1)

- Package CP 01 Elevated Structures, 6 Stations and Depot
- Package CP 02 Elevated Structures and 3 Stations
- Package CP 03 Rolling Stock, and
- Package CP 04 E&M Systems and Track Works
- Package CP 05 Elevated Structure and 1 Station

The Malolos-Clark Railway Project (MCRP)

- Package CP N-01 Building and Engineering Works for Approx.17Kms of Viaduct Structure including Station Buildings at Calumpit and Apalit
- Package CP N-02 Building and Engineering Works for Approx.16Kms of Viaduct Structure including Elevated Station Building at San Fernando
- Package CP N-03 Building and Engineering Works for Approx.12Kms of Viaduct Structure including Elevated Station Buildings at Angeles and Clark
- Package CP N-04 Building and Engineering Works for Approx.6.5Kms of Railway Track Structure including Underground Station at Clark International Airport and
- Package CP N-05 Building and Civil Engineering Works for North Depot Buildings including related infrastructure and Track Work Sub-Ballast

The Malolos-Clark Railway Project (Blumentritt Extension) (MCRP-Ext.)

- Package CP S-01 Building and Civil Engineering Works for approximately 1.2 km of Railway Viaduct Structure including Elevated Station at Blumentritt

The North South Railway Project-South Line (Commuter) (NSRP-South)

- Package CP S-02 Building and Civil Engineering Works for approximately 7.9 km of Railway Viaduct Structure including Elevated Stations at Espana, Santa Mesa and Paco

- Package CP S-03a Building and Engineering Works for approximately 7.9 km of at Grade and Viaduct Railway Track Structure- including Elevated Station at Buendia, and at grade stations at EDSA and Senate
- Package CP S-03b Civil Engineering, Tunnel and Building Works for approximately 6.1 km of Railway with 4.7km of Underground Railway and 1.4km of at-Grade Railway, including FTI Station and Tunnelling Works to connect to MMSP Senate station
- Package CP S-03c Building and Engineering Works for Approximately 5.8 kms of Railway Viaduct Structure including Elevated Stations at Bicutan and Sucat
- Package CP S-04 Building and Civil Engineering Works for approximately 8.5 Kms of Viaduct Structure including 2 Station Buildings at Alabang and Muntinlupa
- Package CP S-05 Building and Civil Engineering Works for approximately 12.8 km of Viaduct Structure including 4 Station Buildings at San Pedro, Pacita, Binan and Santa Rosa
- Package CP S-06 Building and Civil Engineering Works for approximately 10.3 kms of Viaduct Structure and Approximately 1.4 Kms of Depot Access Line including 3 Station Buildings at Cabuyao, Banlic and Calamba
- Package CP S-07 Building and Civil Engineering Works for South Depot Buildings including related infrastructure and Trackwork Sub-Ballast.

The Malolos-Clark Railway Project (MCRP) and the North South Railway Project – South Line (Commuter) (NSRP-South):

- Package CP NS-02 Rolling Stock – Commuter Trainsets
- Package CP NS-03 Rolling Stock – Limited Express Trainsets

The Metro Manila Subway Project (MMSP):

- Package CP 101– Three Underground Stations, Tunnels and Depot
- Package CP 106 – Electromechanical Systems and Track Works
- Package CP 107 – Rolling Stock

Section 1: Platform Screen Door (PSD) and related works at the stations of the North- South Commuter Railway Project (Malolos-Tutuban) (NSCR).
(To be coordinated with GC of NSCR, NS Tren)

Key Date	Description	Month No.
KD 1-1	Achievement: Substantial Completion of installation of Platform Screen Doors and related works to commence Integrated Testing and Commissioning and Test Running using rolling stock in cooperation and coordination with NSCR N-1 project CP 01, CP 02, CP 03 and CP 04 Contractors.	31
KD 1-2	Achievement: Attendance by NS-01 Contractor on the NSCR N-1 project contractors to enable the NSCR N-1 Contractors to hold the Integrated Testing and Commissioning and Test	34

	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 stations.	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

KD 2-6	Achievement: Substantial Completion of Track Works and E&M Systems works to commence Integrated Testing and Commissioning and Test Running at Mainline using Rolling Stock procured under NSCR for full operation.	31
KD 2-7	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding) and all connections between MCRP and NSCR projects, including the Integrated Testing and Commissioning of MCRP and between MCRP and NSCR using rolling stock on the Mainline, at Stations and in the North Depot to allow the Employer with Contractors support to commence Trial Running. a) Between Solis and CIA stations using rolling stock supplied by NSCR N-1 project b) Between Solis and CIA stations using rolling stock supplied by NS-02 contractor.	34 34
KD 2-8	Achievement: Completion of first tranche of Training using Contractor supplied facilities and training aids, and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals.	31
KD 2-9	Attendance on Rolling Stock Contractors NS-02 and NS-03 for performance proving of Rolling Stock and associated E&M systems for Taking Over by the Employer. a) NS-02 trainsets (trainsets 1 to 19) b) NS-03 trainsets (trainsets 1 to 7)	In accordance with the agreed schedules
KD 2-10	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Malolos and CIA Stations b) Between Solis and CIA Stations	37 37
KD 2-11	Achievement: Substantial Completion of installation and testing of workshop equipment and other apparatus in the North Depot.	37
Completion	Achievement: Completion of the whole of works for Section 2.	37 <u>40</u>

Section 3: Section between NSCR stations (Solis exclusive) and Blumentritt and Tutuban stations (inclusive) of the Malolos Clark Railway Project- (Blumentritt Extension) (MCRP-Ext.). Approximate length of 6.479 km and 2 stations.

Key Date	Description	Month No.
KD 3-1	KD 3-1.1 Achievement: Substantial Completion of Power Supply to achieve “Power On” at Blumentritt station.	43
	KD 3-1.2 Achievement: Substantial Completion of Power Supply to achieve “Power On” at Tutuban stations.	43
KD 3-2	Achievement: Substantial Completion of Track Works and E&M Systems works at MCRP-Ext from Blumentritt Station (inclusive) towards Solis Station and Tutuban station, allowing commencement of Integrated Testing and Commissioning and Test Running using rolling stock at Mainline from NS-02 / NS-03 or supplied by NSCR N-1 project in cooperation with NSCR CP 03 Contractor (as available).	44
KD 3-3	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding) and all connections between MCRP-Ext and NSCR projects from Blumentritt Station (inclusive) towards Solis Station and Tutuban Station to allow the Employer to commence Trial Running using rolling stock from NS-02 / NS-03 or supplied by NSCR N-1 project in cooperation with NSCR CP 03 Contractor (as available).	46
KD 3-4	Achievement: Completion of Training and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals	48
KD 3-5	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Blumentritt and Solis Stations & Blumentritt and Tutuban stations.	48
Completion	Achievement: Completion of the whole of works for Section 3.	48

Section 4: Section between Blumentritt station (exclusive) and Calamba station (inclusive) and the South Depot of the North South Railway Project-South Line (Commuter) (NSRP-South). Approximate length of 54.6 km and 18 stations including the South Depot.

Key Date	Description	Month No.
KD 4-1	Design collaboration with N-1 CP 03 Contractor of North-South Commuter Rail Project (Malolos-Tutuban) (NSCR), for signaling, Telecommunications and other on-board systems equipment.	12
KD 4-2	Design collaboration with Metro Manila Subway Project (MMSP), for signaling, Telecommunications and other on-board systems equipment.	12
KD 4-3	Achievement: Substantial Completion of Power Supply and Distribution at South Depot (S-07) to achieve “Power On”.	40
KD 4-4	Achievement: Substantial Completion of Power Supply at all stations to achieve “Power On”. <ul style="list-style-type: none"> a) From Espana Station to Paco Station (S-02) b) For Buendia Station to Nichols Station (S-03a) c) From FTI Station (S-03b) d) From Bicutan Station to Sucat Station (S-03c) e) For Alabang Station and Muntinlupa Station (S-04) f) From San Pedro Station to Santa Rosa Station (S-05) g) From Cabuyao Station to Calamba Station (S-06) 	61 61 75 75 40 40 40
KD 4-5	Achievement: Supply of On-board Equipment including all accessories and fittings at the premises of Rolling Stock Contractors in Japan during the months defined respectively (prior to indicative date) Key Date KD 4-5 is sub-divided as shown below:	
	KD 4-5.1: Supply to NS-02 Contractor for trainset 20	40
	KD 4-5.2: Supply to NS-02 Contractor for trainsets 21 to 25	44
	KD 4-5.3: Supply to NS-02 Contractor for trainsets 26 to 30	48
	KD 4-5.4: Supply to NS-02 Contractor for trainsets 31 to 35	52
	KD 4-5.5: Supply to NS-02 Contractor for trainsets 36 to 38	56
	KD 4-5.6: Supply to MMSP CP 107 Contractor for trainsets 1 to 2	16
	KD 4-5.7: Supply to MMSP CP 107 Contractor for trainsets 3 to 7	18

Key Date	Description	Month No.
	KD 4-5.8: Supply to MMSP CP 107 Contractor for trainsets 8 to 12	20
	KD 4-5.9: Supply to MMSP CP 107 Contractor for trainsets 13 to 17	22
	KD 4-5.10: Supply to MMSP CP 107 Contractor for trainsets 18 to 22	24
	KD 4-5.11: Supply to MMSP CP 107 Contractor for trainsets 23 to 27	26
	KD 4-5.12: Supply to MMSP CP 107 Contractor for trainsets 28 to 30	28
KD 4-6	Achievement: Substantial Completion of sufficient Track Works and related E&M System works in the South Depot to allow CP NS-02 and NS-03 Contractor(s) to stable the Rolling Stock and to carry out Testing and Commissioning of Rolling Stock at the South Depot.	37
KD 4-7	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 the South Depot and Mainline. a) for Partial Operation b) for Full Operation	41 7576
KD 4-8	Achievement: Substantial Completion of Track Works and E&M Systems works to allow CP NS-01 and CP NS-02 and CP NS-03 Contractors to commence Integrated Testing and Commissioning and Test Running at Mainline using rolling stock CP NS-02 and CP NS-03. a) From Calamba to Alabang (Partial Operation) b) From Calamba to CIA (Full Operation)	41 7576
KD 4-9	Achievement: Substantial Completion of the remaining Track Works and all related E&M System Works in the Depot to allow CP NS-02 Contractor to continue carrying out the assembling, testing and commissioning of Rolling Stock at the South Depot, in accordance with the agreed schedule between the Contractor and CP NS-02 Contractor and the Engineer.	In accordance with the agreed schedule
KD 4-10	Achievement: Substantial completion of E&M Systems and Track Works (including rail grinding), including the Integrated Testing and Commissioning using rolling stock, on the Mainline, at Stations and in Depot to allow the Employer with CP NS-01, CP NS-02 and CP NS-03 Contractors support to commence Trial Running using Rolling Stock. a) Between Calamba and Alabang stations (Partial Operation)	

Key Date	Description	Month No.
	b) Between Calamba and CIA stations (Full Operation)	44 78 76
KD 4-11	Achievement: Completion of Training and delivery of contractual spare parts, consumables, tools and jigs, as-built documents, and operation and maintenance manuals.	41
KD 4-12	Attendance on Rolling Stock Contractors for performance proving of Rolling Stock and associated E&M systems for Taking Over by the Employer. a) NS-02 by trainset (20 to 38)	In accordance with the agreed schedule
KD 4-13	Achievement: Substantial Completion of installation and testing of workshop equipment and other apparatus in the South Depot.	76
Completion of the Works	Achievement: Completion of the whole of the Works for Section 4 and the whole of the Works except attendance on Rolling Stock Contractor for performance proving.	79 76
KD 4-14	Assist the Employer to obtain the certification (permission) from the regulatory authority to commence the commercial operations for the railway. a) Between Calamba and Alabang Stations b) Between Calamba and CIA Stations	47 79 76
Completion of the Works	Achievement: Completion of the whole of works including attendance on Rolling Stock for performance proving.	79 76

ATTACHMENT 2

TIME FOR ACCESS TO AND POSSESSION OF THE SITE

[To be finalized prior to issuing the Bidding Documents.]

- (1) The date on which the right to access to and possess the Site as the works area available to the Contractor for the commencement of the Works, are defined as Access Date (ADxCPy) and described below.

Where: ADx is the scope of the works area for permitting the Contractor to commence its works.

CPy is the corresponding Contract Package and described in Clause (4) *[Contract Package]* in Attachment-1 to the Particular Conditions Part A Contract Data.

- (2) Month numbers shown in the schedule signify the lapsed time in months from the Commencement Date. The month numbers will be converted into actual calendar dates after receipt by the Contractor of the Engineer's notification of the Commencement Date.

Section 1: Platform Screen Door (PSD) and related works at the stations of the North - South Commuter Railway Project (Malolos-Tutuban) (NSCR).
(To be coordinated with GC of NSCR, NS Tren.)

Access Date		Site (Works Area)	Month no.
AD 1	Provision of access to all station rooms including electrical and equipment room, signaling area, power distribution room, other related room, galleries, duct required to commence and continue the preparatory works for installation of PSD. Access Date AD 1 is subdivided into the following:		
	NSCR CP 01 and CP 04	AD 1.1: 2 of 6 Stations	16
		AD 1.2: 4 of 6 Stations	16
		AD 1.3: 6 of 6 Stations	28
	NSCR CP 02 and CP 04	AD 1.4: 1 of 3 stations	14
		AD 1.5: 2 of 3 stations	14
		AD 1.6: 3 of 3 stations	14

Access Date	Site (Works Area)	Month no.
AD 2	Provision of access to all concourse / platforms paid / unpaid area, and the related E&M System/Sub-system to allow CP NS-01 contractor to commence and continue the installation of PSD and related works. Access Date AD 2 is subdivided into the following:	
NSCR CP 01 and CP 04	AD 2.1: 2 of 6 Stations	16
	AD 2.2: 4 of 6 Stations	16
	AD 2.3: 6 of 6 Stations	28
NSCR CP 02 and CP 04	AD 2.4: 1 of 3 stations	14
	AD 2.5: 2 of 3 stations	14
	AD 2.6: 3 of 3 stations	14

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

Access Date	Site (Works Area)	Month no.
AD 1	Provision of access to Trackway basic structure complete for viaducts, bridges, U-shaped structure, box culvert, elevated stations, at-grade stations and underground station of Mainline and approach line to the North Depot. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works. The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages. Access Date 1 is subdivided into following:	
CP N-01 From km 34+749 to km 51.670	AD 1.1.1: 500 meters of the following viaduct sections (approximately 1,000 meters total): From km 40+634 to km 41+134 From km 41+134 to km 41+634 and approximately 2,500 meters within the remaining viaduct section. (approximately 3,500 meters total)	19
	AD 1.1.2: Approximately 7,000 meters within any viaduct section.	22

Access Date		Site (Works Area)	Month no.
		AD 1.1.3: Approximately 10,500 meters within any viaduct section.	24
		AD 1.1.4: The remaining viaduct section.	27
	CP N-02 From km 51+670 to km 67+440	AD 1.2.1: 500metres of the following viaduct sections (approximately 1,000 meters total): From km 58+095 to km 58+595 From km 58+595 to km 59+095 and approximately 2,500 meters within the remaining viaduct section. (approximately 3,500 meters total)	15
		AD 1.2.2: Approximately 7,000 meters within any viaduct section.	18
		AD 1.2.3: Approximately 10,500 meters within any viaduct section.	20
		AD 1.2.4: The remaining viaduct section.	23
	CP N-03 From km 67+440 to km 79+880	AD 1.3.1(a): 1,209 meters of the following viaduct sections: From km 78+471 to km 79+680	7
		AD 1.3.1(b): 1,385 meters of the following viaduct sections: From km 73+155 to km 73+655 From km 73+655 to km 74+155 From km 78+090 to km 78+471 and approximately 410 meters within the remaining viaduct section. (approximately 3,000 meters total)	19
		AD 1.3.2: Approximately 6,000 meters within any viaduct section.	22
		AD 1.3.3: Approximately 9,500 meters within any viaduct section.	24
		AD 1.3.4: The remaining viaduct section.	27
	CP N-04 U-shaped structure, box culvert and	AD 1.4.1: Access to 2,000m of the section from km 76+680 to km 83+185.	11
		AD 1.4.2: Access to the remaining section from km 76+680 to km 83+185.	13

Access Date		Site (Works Area)	Month no.
	Station	AD 1.4.3: Box Structure from KM 83KM+185 to the track end at Clark International Airport (CIA) Station (km 86+167)	16
		AD 1.4.4: Precast prestressed I girder slab: Southbound: km 0+000 to km 0+675 Northbound: km 0+000 to km 0+650	12
		AD 1.4.5 Compacted sub-ballast for the following section of Depot trackway: Southbound: km 0+675 to km 1+320 Northbound: km 0+650 to km 1+320	12
AD 2	Access to Substation, Battery Posts, Signaling/ Telecommunication/ Railway Electric House/Sectioning Post to commence electrical works. Access Date 2 is subdivided into following:		
	CP N-01	AD 2.1.1: Receiving Sub-Station No.10,11,12 and 13	20
		AD 2.1.2: Battery post BP-1	21.5
		AD 2.1.3: Signaling/Telecommunication/Railway Electric House-Calumpit station	25
		AD 2.1.4: Signaling/Telecommunication/Railway Electric House-Apalit station	24.5
	CP N-02	AD 2.2.1: Receiving Sub-Station No.14,15,16 and 17	16
		AD 2.2.2: Battery post BP-2	17.5
		AD 2.2.3: Signaling/Telecommunication/Railway Electric House - San Fernando station	20.5
	CP N-03	AD 2.3.1(a): Receiving Sub-Station No. 21	20
		AD 2.3.1(b): Receiving Sub-Station No.18,19 and 20	20
		AD 2.3.2: Battery post BP-3 and 4	26.5
		AD 2.3.3: Signaling/Telecommunication/Railway Electric House- Angeles station	22.5
		AD 2.3.4: Signaling/Telecommunication/Railway Electric House- Clark station	13

Access Date		Site (Works Area)	Month no.
	CP N-04	AD 2.4.1: Receiving Sub-Station No. 22	9
		AD 2.4.2: Railway Electrical House/Room of CIA Station	14
		AD 2.4.3: Sectioning Post	9
AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms, including galleries/duct to enable CP NS-01 Contractor to commence and continue E&M Systems/Subsystems works		
	Access Date 3 is subdivided into following:		
	CP N-01	AD 3.1.1: Intermediate Signal Equipment Room between Malolos Station and Calumpit Station	28
		AD 3.1.2: Calumpit Station	27
		AD 3.1.3: Apalit Station	25
	CP N-02	AD 3.2.1: Intermediate Signaling Equipment Room between Apalit Station and San Fernando	23
		AD 3.2.2: Intermediate Signaling Equipment Room between San Fernando Station and Angeles	20
		AD 3.2.3: San Fernando Station	20.5
	CP N-03	AD 3.3.1: Angeles Station	22.5
		AD 3.3.2: Clark Station	13
	CP N-04	AD 3.4.1: CIA Station	14
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 N-01	AD 4.1.1: Calumpit Station and Apalit Station	24
	CP N-02	AD 4.2.1: San Fernando Station	20
	CP N-03	AD 4.3.1: Angeles Station	24
		AD 4.3.2: Clark Station	15

Access Date		Site (Works Area)	Month no.
	CP N-04	AD 4.4.1: CIA Station	16
AD 5	CP N-05	Access to Stabling Yard, Maintenance Depot Facilities, Building, Plants and Facilities and provision of access to thereof to allow CP NS-01 Contractor and CP NS-02 and CP NS-03 Contractor, when applicable to commence and continue installation of the track works and the E&M system/subsystem works. Access Date 5 is subdivided into following:	
		AD 5.5.1: Provision of access to OCC Annex (Central Equipment Building) including galleries/ducts	13
		AD 5.5.2: Provision of access to Depot Substation	14
		AD 5.5.3: Provision of access to area for track works in stages to allow CP NS-01 Contractor to commence and continue the track works and related E&M system/ subsystem works as coordinated by the Engineer.	14
		AD 5.5.4: Provision of access to Light Repair Shop and other facilities to allow CP NS-01 Contractor to commence and continue installation works.	18
		AD 5.5.5: Provision of access to CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run of Full Operation.	31
AD 6	CP N-01 through CP N-04	Provision of access to all stations & viaducts to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run of Full Operation.	32

Section 3: Section between Solis stations (exclusive) and Blumentritt/Tutuban stations (inclusive) of the Malolos Clark Railway Project (Blumentritt Extension) (MCRP-Ext.). Approximate length of 6.479 km and 2 stations.

Access Date	Site (Works Area)	Month no.
AD 1	<p>Provision of access to Trackway basic structure for viaducts, Bridges and station of Mainline. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works.</p> <p>The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages.</p> <p>Access Date 1 is subdivided into following:</p>	
CP S-01 (1.400km)	AD 1-1: Approximately 1,400 metres of viaduct section.	33
From km 1+329 (towards Solis) and 1+360 (towards to Tutuban) to km 2+405		
CP05(a) (0.834km)	AD 1-2: 834 metres of viaduct section.	33
From km 0+495 to km 1+329		
CP05(b) (4,245km)	AD 1-3: 4,245 metres of viaduct section.	33
From km 1+360 to km -2+885		
AD 2	<p>Access to NSCR stations including duct/galleries, and NSCR E&M Systems/Sub-System to allow CP NS-01 Contractor to commence the connection and system integration to NSCR E&M System/Sub-System.</p> <p>Access Date 2 is subdivided into following:</p>	
NSCR CP04/CP01 - Solis Station	AD 2-1: E&M Systems/Subsystems.	38

AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms including galleries/duct to enable CP NS-01 Contractor to commence and continue E&M system/ subsystem works.		
	CP S-01	AD 3-1: Blumentritt Station	35
	CP05(b)	AD 3-2: Tutuban Station	35
AD 4	Access to all stations, concourse paid/unpaid area including station platform floor for allow CP NS-01 Contractor to commence and continue installation of AFC and PSD including related E&M system/subsystem works.		
	CP S-01	AD 4-1: Blumentritt Station	37
	CP05(b)	AD 4-2: Tutuban Station	37
AD 5	Provision of access to Blumentritt and Tutuban Stations to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run.		43

Section 4: Section between Blumentritt station (exclusive) and Calamba station (inclusive) and the south depot of the North South Railway Project-South Line (Commuter) (NSRP-South). Approximate length of 54.6 km and 18 stations including the south depot.

Access Date		Site (Works Area)	Month no.
AD 1	Provision of access to Trackway basic structure of viaducts, bridges, stations, at-grade structures including approach line to Depot. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works.		
	The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages.		
	Access Date 1 is subdivided into following:		
	CP S-02 (7.895km)	AD 1.2.1: 3,000 meters within any viaduct, bridge	37
	From km 2+405 to km 10+308	AD 1.2.2: Approximately 7,000 meters within any viaduct section.	40
		AD 1.2.3: The remaining viaduct section.	43
	CP S-03(a) (7.9km)	AD 1.3(a).1: Approximately 2,800 meters within any viaduct, bridge	46
	From km	AD 1.3(a).2: Approximately 5,600 meters within	48

	10+308 to km 18+200	any viaduct, bridge	
		AD 1.3(a).3 The remaining viaduct section.	50
	CP S-03(b) (1.4km) From km 18+200 to km 19+596	AD 1.3(b).1: Approximately 1,000 meters within any viaduct, bridge and/or at-grade sections	51
		AD 1.3(b).2: The remaining section.	68
	CP S-03(c) (5.8km) From km 19+596 to km 25+412	AD 1.3(c).1: Approximately 2,800 meters within any viaduct section.	46
		AD 1.3(c).2: The remaining viaduct section.	49
	CP S-04 (8.454km) From km 25+500 to km 33+954	AD 1.4.1: Approximately 3,000 meters within any viaduct section.	30
		AD 1.4.2: Approximately 6,000 meters within any viaduct section.	33
		AD 1.4.3: The remaining viaduct section.	35
	CP S-05 (12.726km) km 33+954 to km 46+730	AD 1.5.1: Approximately 3,000 meters within any viaduct section.	27
		AD 1.5.2: Approximately 6,000 meters within any viaduct section.	29
		AD 1.5.3: Approximately 9,000 meters within any viaduct section.	31
		AD 1.5.4: The remaining viaduct section.	33
	CP S-06 (10.27km) km 46+730 to km 57+000	AD 1.6.1: Approximately 3,000 meters within any viaduct section.	27
		AD 1.6.2: Approximately 6,000 meters within any viaduct section.	29
		AD 1.6.3: Approximately 9,000 meters within any viaduct section.	31
		AD 1.6.4: The remaining viaduct section	33
AD 2	Access to Substations to commence electrical works.		

	Access Date 2 is subdivided into following:		
	CP S-02	AD 2.2.1: Receiving Sub-Stations No. S1 and S2	41
	CP S-03(a)	AD 2.3a.1: Receiving Sub-Stations No. S3 and S4	46
	CP S-03(c)	AD 2.3b.1: Receiving Sub-Stations No. S5, and S6	46
	CP S-04	AD 2.4.1: Receiving Sub-Stations (No. S7, S8 and S9)	30
	CP S-05	AD 2.5.1: Receiving Sub-Stations (No. S10, S11, S12, S13 and S14)	30
	CP S-06	AD 2.6.1: Receiving Sub-Stations (No. S15, S16, S17 and S18)	30
AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms to enable CP NS-01 Contractor to commence and continue E&M Systems/Subsystems works.		
	Access Date 3 is subdivided into following:		
	CP S-02	AD 3.2.1: Railway Electrical Room	
		a. Espana,	39
		b. Santa Mesa,	41
		c. Paco	42
		AD 3.2.2: Railway Signaling and Telecommunications Room	39
		a. Espana,	41
		b. Santa Mesa,	42
		c. Paco,	
	CP S-03a	AD 3.3a.1: Railway Electrical Room	
		a. Buendia,	47
		b. EDSA,	47
		c. Nichols	48
		AD 3.3a.2: Railway Signaling and Telecommunications Room	
		a. Buendia,	47
		b. EDSA,	47
		c. Nichols	48

	CP S-03b	AD 3.3b.1: Railway Electrical Room	
		a. FTI	68
		AD 3.3b.2: Railway Signaling and Telecommunications Room	
		a. FTI	68
	CP S-03c	AD 3.3c.1: Railway Electrical Room	
		a. Bicutan,	49
		b. Sucat	49
		AD 3.3c.2: Railway Signaling and Telecommunications Room	
		a. Bicutan,	49
		b. Sucat	49
	CP S-04	AD 3.4.1: Railway Electrical Room	
		a. Alabang,	34
		b. Muntinlupa	32
		AD 3.4.2: Railway Signaling and Telecommunications Room	
		a. Alabang,	35
		b. Muntinlupa	33
	CP S-05	AD 3.5.1: Railway Electrical Room	
		a. San Pedro,	33
		b. Pacita,	31
		c. Binan,	31
		d. Santa Rosa	33
		AD 3.5.2: Railway Signaling 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
			34

		c. Calamba	
		AD 3.6.2: Railway Signaling and Telecommunications Room	
		a. Cabuyao, b. Banlic, c. Calamba	35 33 35
	CP S-07	AD 3.7.1: South Depot Section Post	36
AD 4	Access to concourse paid/unpaid area including station platform area 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, b. Santa Mesa, c. Paco	41 44 46
	CP S-03a	AD 4.3a.1: a. Buendia, b. EDSA, c. Nichols	54 54 50
	CP S-03b	AD 4.3b.1: a. FTI	68
	CP S-03c	AD 4.3c.1: a. Bicutan, b. Sucat	52 52
	CP S-04	AD 4.4.1: a. Alabang, b. Muntinlupa	36 34
	CP S-05	AD 4.5.1: a. San Pedro, b. Pacita, c. Binan,	36 34 34

		d. Santa Rosa	36
	CP S-06	AD 4.6.1: a. Cabuyao, b. Banlic, c. Calamba	36 34 36
AD 5	CP S-07	Access to Depot Stabling Yard, Maintenance Depot Facilities, Buildings, Plant and Facilities and provision of access to thereof to allow CP NS-01 Contractor to commence and continue installation of the track works and the E&M system/subsystem works. Access Date 5 is subdivided into following:	
		AD 5.7.1: Provision of access to OCC Building	36
		AD 5.7.2: Provision of access to area for track works in stages to allow CP NS-01 Contractor to commence and continue the track works and related E&M system/ subsystem works as coordinated by the Engineer.	34
		AD 5.7.3: Provision of access to Light Repair Shop for Partial Operation to allow CP NS-01 Contractor to commence and continue installation works.	36
		AD 5.7.4: Provision of access to Unscheduled Repair Shop, Wheel Re-profiling, Maintenance Car Shop, and Car wash track (as a temporary washing area) for Partial Operation to allow CP NS-01 Contractor to commence and continue installation works.	38
		AD 5.7.5: Provision of access to other depot buildings and facilities not included in AD 5.7.3 and AD 5.7.4 to allow CP NS-01 Contractor to commence and continue installation and related E&M system/subsystem works.	48
		AD 5.7.6: Provision of access to CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run. Partial Operation Full Operation	41 76

AD 6	CP S-02 through CP S-06	Provision of access to all stations to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Running.	
		Partial Operation	41
		Full Operation	76
AD 7	CP S-02 through CP S-06	Provision of access to all railway structures. For Trial Running.	
		Partial Operation	44
		Full Operation	76

ATTACHMENT 2

TIME FOR ACCESS TO AND POSSESSION OF THE SITE

[To be finalized prior to issuing the Bidding Documents.]

- (1) The date on which the right to access to and possess the Site as the works area available to the Contractor for the commencement of the Works, are defined as Access Date (ADxCPy) and described below.

Where: ADx is the scope of the works area for permitting the Contractor to commence its works.

CPy is the corresponding Contract Package and described in Clause (4) *[Contract Package]* in Attachment-1 to the Particular Conditions Part A Contract Data.

- (2) Month numbers shown in the schedule signify the lapsed time in months from the Commencement Date. The month numbers will be converted into actual calendar dates after receipt by the Contractor of the Engineer's notification of the Commencement Date.

Section 1: Platform Screen Door (PSD) and related works at the stations of the North - South Commuter Railway Project (Malolos-Tutuban) (NSCR).
(To be coordinated with GC of NSCR, NS Tren.)

Access Date		Site (Works Area)	Month no.
AD 1	Provision of access to all station rooms including electrical and equipment room, signaling area, power distribution room, other related room, galleries, duct required to commence and continue the preparatory works for installation of PSD. Access Date AD 1 is subdivided into the following:		
	NSCR CP 01 and CP 04	AD 1.1: 2 of 6 Stations	16
		AD 1.2: 4 of 6 Stations	16
		AD 1.3: 6 of 6 Stations	28
	NSCR CP 02 and CP 04	AD 1.4: 1 of 3 stations	14
		AD 1.5: 2 of 3 stations	14
		AD 1.6: 3 of 3 stations	14

Access Date	Site (Works Area)	Month no.
AD 2	Provision of access to all concourse / platforms paid / unpaid area, and the related E&M System/Sub-system to allow CP NS-01 contractor to commence and continue the installation of PSD and related works. Access Date AD 2 is subdivided into the following:	
NSCR CP 01 and CP 04	AD 2.1: 2 of 6 Stations	16
	AD 2.2: 4 of 6 Stations	16
	AD 2.3: 6 of 6 Stations	28
NSCR CP 02 and CP 04	AD 2.4: 1 of 3 stations	14
	AD 2.5: 2 of 3 stations	14
	AD 2.6: 3 of 3 stations	14

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

Access Date	Site (Works Area)	Month no.
AD 1	Provision of access to Trackway basic structure complete for viaducts, bridges, U-shaped structure, box culvert, elevated stations, at-grade stations and underground station of Mainline and approach line to the North Depot. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works. The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages. Access Date 1 is subdivided into following:	
CP N-01 From km 34+749 to km 51.670	AD 1.1.1: 500 meters of the following viaduct sections (approximately 1,000 meters total): From km 40+634 to km 41+134 From km 41+134 to km 41+634 and approximately 2,500 meters within the remaining viaduct section. (approximately 3,500 meters total)	19
	AD 1.1.2: Approximately 7,000 meters within any viaduct section.	22

Access Date		Site (Works Area)	Month no.
		AD 1.1.3: Approximately 10,500 meters within any viaduct section.	24
		AD 1.1.4: The remaining viaduct section.	27
	CP N-02 From km 51+670 to km 67+440	AD 1.2.1: 500metres of the following viaduct sections (approximately 1,000 meters total): From km 58+095 to km 58+595 From km 58+595 to km 59+095 and approximately 2,500 meters within the remaining viaduct section. (approximately 3,500 meters total)	15
		AD 1.2.2: Approximately 7,000 meters within any viaduct section.	18
		AD 1.2.3: Approximately 10,500 meters within any viaduct section.	20
		AD 1.2.4: The remaining viaduct section.	23
	CP N-03 From km 67+440 to km 79+880	AD 1.3.1(a): 1,209 meters of the following viaduct sections: From km 78+471 to km 79+680	7
		AD 1.3.1(b): 1,385 meters of the following viaduct sections: From km 73+155 to km 73+655 From km 73+655 to km 74+155 From km 78+090 to km 78+471 and approximately 410 meters within the remaining viaduct section. (approximately 3,000 meters total)	19
		AD 1.3.2: Approximately 6,000 meters within any viaduct section.	22
		AD 1.3.3: Approximately 9,500 meters within any viaduct section.	24
		AD 1.3.4: The remaining viaduct section.	27
	CP N-04 U-shaped structure, box culvert and	AD 1.4.1: Access to 2,000m of the section from km 76+680 to km 83+185.	11
		AD 1.4.2: Access to the remaining section from km 76+680 to km 83+185.	13

Access Date		Site (Works Area)	Month no.
	Station	AD 1.4.3: Box Structure from KM 83KM+185 to the track end at Clark International Airport (CIA) Station (km 86+167)	16
		AD 1.4.4: Precast prestressed I girder slab: Southbound: km 0+000 to km 0+675 Northbound: km 0+000 to km 0+650	12
		AD 1.4.5 Compacted sub-ballast for the following section of Depot trackway: Southbound: km 0+675 to km 1+320 Northbound: km 0+650 to km 1+320	12
AD 2	Access to Substation, Battery Posts, Signaling/ Telecommunication/ Railway Electric House/Sectioning Post to commence electrical works. Access Date 2 is subdivided into following:		
	CP N-01	AD 2.1.1: Receiving Sub-Station No.10,11,12 and 13	20
		AD 2.1.2: Battery post BP-1	21.5
		AD 2.1.3: Signaling/Telecommunication/Railway Electric House-Calumpit station	25
		AD 2.1.4: Signaling/Telecommunication/Railway Electric House-Apalit station	24.5
	CP N-02	AD 2.2.1: Receiving Sub-Station No.14,15,16 and 17	16
		AD 2.2.2: Battery post BP-2	17.5
		AD 2.2.3: Signaling/Telecommunication/Railway Electric House - San Fernando station	20.5
	CP N-03	AD 2.3.1(a): Receiving Sub-Station No. 21	20
		AD 2.3.1(b): Receiving Sub-Station No.18,19 and 20	20
		AD 2.3.2: Battery post BP-3 and 4	26.5
		AD 2.3.3: Signaling/Telecommunication/Railway Electric House- Angeles station	22.5
		AD 2.3.4: Signaling/Telecommunication/Railway Electric House- Clark station	13

Access Date		Site (Works Area)	Month no.
	CP N-04	AD 2.4.1: Receiving Sub-Station No. 22	9
		AD 2.4.2: Railway Electrical House/Room of CIA Station	14
		AD 2.4.3: Sectioning Post	9
AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms, including galleries/duct to enable CP NS-01 Contractor to commence and continue E&M Systems/Subsystems works		
	Access Date 3 is subdivided into following:		
	CP N-01	AD 3.1.1: Intermediate Signal Equipment Room between Malolos Station and Calumpit Station	28
		AD 3.1.2: Calumpit Station	27
		AD 3.1.3: Apalit Station	25
	CP N-02	AD 3.2.1: Intermediate Signaling Equipment Room between Apalit Station and San Fernando	23
		AD 3.2.2: Intermediate Signaling Equipment Room between San Fernando Station and Angeles	20
		AD 3.2.3: San Fernando Station	20.5
	CP N-03	AD 3.3.1: Angeles Station	22.5
		AD 3.3.2: Clark Station	13
	CP N-04	AD 3.4.1: CIA Station	14
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 N-01	AD 4.1.1: Calumpit Station and Apalit Station	24
	CP N-02	AD 4.2.1: San Fernando Station	20
	CP N-03	AD 4.3.1: Angeles Station	24
		AD 4.3.2: Clark Station	15

Access Date		Site (Works Area)	Month no.
	CP N-04	AD 4.4.1: CIA Station	16
AD 5	CP N-05	Access to Stabling Yard, Maintenance Depot Facilities, Building, Plants and Facilities and provision of access to thereof to allow CP NS-01 Contractor and CP NS-02 and CP NS-03 Contractor, when applicable to commence and continue installation of the track works and the E&M system/subsystem works. Access Date 5 is subdivided into following:	
		AD 5.5.1: Provision of access to OCC Annex (Central Equipment Building) including galleries/ducts	13
		AD 5.5.2: Provision of access to Depot Substation	14
		AD 5.5.3: Provision of access to area for track works in stages to allow CP NS-01 Contractor to commence and continue the track works and related E&M system/ subsystem works as coordinated by the Engineer.	14
		AD 5.5.4: Provision of access to Light Repair Shop and other facilities in Section A specified in the Drawing to allow CP NS-01 Contractor to commence and continue installation works.	18
		AD 5.5.5: Provision of access to CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run of Full Operation.	31
AD 6	CP N-01 through CP N-04	Provision of access to all stations & viaducts to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run of Full Operation.	32

Section 3: Section between Solis stations (exclusive) and Blumentritt/Tutuban stations (inclusive) of the Malolos Clark Railway Project (Blumentritt Extension) (MCRP-Ext.). Approximate length of 6.479 km and 2 stations.

Access Date	Site (Works Area)	Month no.
AD 1	<p>Provision of access to Trackway basic structure for viaducts, Bridges and station of Mainline. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works.</p> <p>The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages.</p> <p>Access Date 1 is subdivided into following:</p>	
CP S-01 (1.400km)	AD 1-1: Approximately Approximately 1,400 metres of viaduct section.	33
From km 1+329 (towards Solis) and 1+360 (towards to Tutuban) to km 2+405		
CP05(a) (0.834km)	AD 1-2: 834 metres of viaduct section.	33
From km 0+495 to km 1+329		
CP05(b) (4,245km)	AD 1-3: 4,245 metres of viaduct section.	33
From km 1+360 to km -2+885		
AD 2	<p>Access to NSCR stations including duct/galleries, and NSCR E&M Systems/Sub-System to allow CP NS-01 Contractor to commence the connection and system integration to NSCR E&M System/Sub-System.</p> <p>Access Date 2 is subdivided into following:</p>	
NSCR CP04/CP01 - Solis Station	AD 2-1: E&M Systems/Subsystems.	38

AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms including galleries/duct to enable CP NS-01 Contractor to commence and continue E&M system/ subsystem works.		
	CP S-01	AD 3-1: Blumentritt Station	35
	CP05(b)	AD 3-2: Tutuban Station	35
AD 4	Access to all stations, concourse paid/unpaid area including station platform floor for allow CP NS-01 Contractor to commence and continue installation of AFC and PSD including related E&M system/subsystem works.		
	CP S-01	AD 4-1: Blumentritt Station	37
	CP05(b)	AD 4-2: Tutuban Station	37
AD 5	Provision of access to Blumentritt and Tutuban Stations to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run.		43

Section 4: Section between Blumentritt station (exclusive) and Calamba station (inclusive) and the south depot of the North South Railway Project-South Line (Commuter) (NSRP-South). Approximate length of 54.6 km and 18 stations including the south depot.

Access Date		Site (Works Area)	Month no.
AD 1	Provision of access to Trackway basic structure of viaducts, bridges, stations, at-grade structures including approach line to Depot. All temporary opening above/below trackway closed, temporary drainage system provided, walkway & access provided, surface access routes provided, all duct and cable route complete etc. for allowing CP NS-01 Contractor to commence and continue E&M Systems and Track Works.		
	The minimum length of Mainline and approach line to be available to CP NS-01 Contractor for continuity of works is approximately 1 km. The exact location and date for each section to make available to CP NS-01 Contractor shall be coordinated at the 1st Coordination Meeting upon the award of related Contract Packages.		
	Access Date 1 is subdivided into following:		
	CP S-02 (7.895km)	AD 1.2.1: 3,000 meters within any viaduct, bridge	37
	From km 2+405 to km 10+308 From km 2+405 to km 10+300	AD 1.2.2: Approximately 67 ,000 meters within any viaduct, bridge and/or at-grade section.	40
		AD 1.2.3: The remaining viaduct section.	43
	CP S-03(a) (7.9km)	AD 1.3(a).1(a): Approximately 2,800 meters at grade within any viaduct, bridge	46

	From km 10+308 to km 18+200 From km 10+300 to km 14+800	AD 1.3(a).2: Approximately 5,600 meters within any viaduct, bridge AD 1.3.2(a): The remaining viaduct section— Except for Buendia station	48
		AD 1.3(a).3 The remaining viaduct section. AD 1.3.3(a) Buendia Station	50
	CP S-03(b) (6.1 1.4km)	AD 1.3(b).1: Approximately 1,000 metres meters within any viaduct, bridge and/or at-grade sections	51
	From km 18+200 to km 19+596 From km 14+800 to km 25+500	AD 1.3(b).2: The remaining station & viaduct section.	68
	CP S-03(c) (5.8km)	AD 1.3(c—).1: Approximately 3,000 2,800 metres meters within any viaduct section.	46
	From km 19+596 to km 25+412	AD 1.3(c-).2: The remaining viaduct section.-	49
	CP S-04 (8.454km)	AD 1.4.1: Approximately 3,000 metres meters within any viaduct, bridge and/or at-grade sections <u>section.</u>	30
	From km 25+500 to km 33+954	AD 1.4.2: Approximately 6,000 meters within any viaduct section.	33
		AD 1.4.3: The remaining viaduct section.	35
	CP S-05 (12.726km)	AD 1.5.1: Approximately 3,000 meters within any viaduct section.	27
	km 33+954 to km 46+730	AD 1.5.2: Approximately 6,000 meters within any viaduct section.	29
		AD 1.5.3: Approximately 9,000 meters within any viaduct section.	31
		AD 1.5.4: The remaining viaduct section.	33
	CP S-06 (10.27km)	AD 1.6.1: Approximately 3,000 meters within any viaduct section.	27
	km 46+730 to km 57+000	AD 1.6.2: Approximately 6,000 meters within any viaduct section.	29
		AD 1.6.3: Approximately 9,000 meters within any	31

		viaduct section.	
		AD 1.6.4: The remaining viaduct section	33
AD 2	Access to Substations to commence electrical works. Access Date 2 is subdivided into following:		
	CP S-02	AD 2.2.1: Receiving Sub-Stations No. S1 and S2	41
	CP S-03(a)	AD 2.3a.1: Receiving Sub-Stations No. S3 and S4	46
	CP S-03(c)	AD 2.3b.1: Receiving Sub-Stations No. S5, and S6	46
	CP S-04	AD 2.4.1: Receiving Sub-Stations (No. S7, S8 and S9)	30
	CP S-05	AD 2.5.1: Receiving Sub-Stations (No. S10, S11, S12, S13 and S14)	30
	CP S-06	AD 2.6.1: Receiving Sub-Stations (No. S15, S16, S17 and S18)	30
AD 3	Access to equipment rooms, signaling, telecommunications, power distribution, cable rooms and other related rooms, including galleries/duct to enable CP NS-01 Contractor to commence and continue E&M Systems/Subsystems works. Access Date 3 is subdivided into following:		
	CP S-02	AD 3.2.1: Railway Electrical Room	
		a. Espana,	39
		b. Santa Mesa,	41
		c. Paco	42
		AD 3.2.2: Railway Signaling and Telecommunications Room	39
		a. Espana,	41
		b. Santa Mesa,	42
		c. Paco,	
	CP S-03a	AD 3.3a.1: Railway Electrical Room	
		a. Buendia,	47
		b. EDSA,	47
		c. Nichols	48

		AD 3.3a.2: Railway Signaling and Telecommunications Room	
		a. Buendia,	47
		b. EDSA,	47
		c. Nichols	48
	CP S-03b	AD 3.3b.1: Railway Electrical Room	
		a. FTI	68
		AD 3.3b.42: Railway Signaling and Telecommunications Room	
		a. FTI	68
	CP S-03c	AD 3.3c.1: Railway Electrical Room	
		a. Bicutan,	49
		b. Sucat	49
		AD 3.3c.2: Railway Signaling and Telecommunications Room	
		a. Bicutan,	49
		b. Sucat	49
	CP S-04	AD 3.4.1: Railway Electrical Room	
		a. Alabang,	34
		b. Muntinlupa	32
		AD 3.4.2: Railway Signaling and Telecommunications Room	
		a. Alabang,	35
		b. Muntinlupa	33
	CP S-05	AD 3.5.1: Railway Electrical Room	
		a. San Pedro,	33
		b. Pacita,	31
		c. Binan,	31
		d. Santa Rosa	33

		AD 3.5.2: Railway Signaling 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 Signaling 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 area 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

	CP S-03c	AD 4.3c.1: a. Bicutan, b. Sucat	52 52
	CP S-04	AD 4.4.1: a. Alabang, b. Muntinlupa	36 34
	CP S-05	AD 4.5.1: a. San Pedro, b. Pacita, c. Binan, d. Santa Rosa	36 34 34 36
	CP S-06	AD 4.6.1: a. Cabuyao, b. Banlic, c. Calamba	36 34 36
AD 5	CP S-07	Access to <u>Depot</u> Stabling Yard, Maintenance Depot Facilities, Buildings, Plant and Facilities and provision of access to thereof to allow CP NS-01 Contractor to commence and continue installation of the track works and the E&M system/subsystem works. Access Date 5 is subdivided into following:	
		AD 5.7.1: Provision of access to OCC Annex (Central Equipment Building) Building including galleries/ducts	36
		AD 5.7.2: Provision of access to area for track works in stages to allow CP NS-01 Contractor to commence and continue the track works and related E&M system/ subsystem works as coordinated by the Engineer.	34
		AD 5.7.3: Provision of access to Light Repair Shop for Partial Operation to allow CP NS-01 Contractor to commence and continue installation works.	36
		AD 5.7.4: Provision of access to Unscheduled Repair Shop, Wheel Re-profiling, Maintenance car <u>Car shop</u> Shop, and Car wash track (as a temporary washing area) and others specified in	38

		the Employer's Requirement and the Drawing for Partial Operation to allow CP NS-01 Contractor to commence and continue installation works.	
		AD 5.7.5: Provision of access to <u>other depot buildings and</u> facilities not included in AD 5.7.3 and AD 5.7.4 to allow CP NS-01 Contractor to commence and continue installation and related E&M system/subsystem works.	48
		AD 5.7.6: Provision of access to CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Run. Partial Operation Full Operation	41 76
AD 6	CP S-02 through CP S-06	Provision of access to all stations to allow CP NS-01 Contractor to commence Integrated System Testing and commissioning in preparation for Trial Running. Partial Operation Full Operation	41 76
AD 7	CP S-02 through CP S-06	Provision of access to all railway structures. For Trial Running. Partial Operation Full Operation	44 79 76