



General Bid Bulletin No. 35

13 October 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" Clarification 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					
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ltem No.	Volume Section No. Page No. Clause No. / Title Reference Text	Clarification Request	Proposed Revised Text (if any)	Response		
1	Volume I. Section. II., BDS-10, ITB 24.1, The deadline for Bid submission is: Date: 11 October 2021 Time: 10:00 AM"	 With consideration of the guidelines of the Inter-Agency Task Force on Emerging Infectious Disease and the Department of Health, uncertainties are posed by the issuance of the Community Quarantine. In addition to this, we still have various important clarifications for your tender conditions, but have not yet got all proper replies against clarifications which we already submitted. In this light, we humbly request for an extension of the deadline for Bid submission be moved to 17 November 2021 		The Bid Submission Date shall remain on 10 November 2021.		
2	Ch.12 Integrated Operational Control Center.pdf ERT 1071, 12.2.2, The Contractor shall prepare and implement the requirements of a detailed Migration Plan covering strategy, timeline, testing, and decommissioning during	It is recognized that the OCC integration is the responsibility of the NS-01 Contractor and the SOW is described below. - NS-01 Contractor to conduct connection test from IOCC to NSCR equipment. - CP04 Contractor to change NSCR equipment configuration.		The Bidder understanding is correct. CP04 shall provide the changes in the CP04 equipment based on interfaces to be agreed with CP NS-01. Please note that the CP04 shall not provide any equipment in the IOCC and that any additional interface servers in CP04-Equipment rooms shall be provided by CP NS-01.		

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	the transfer of the OCC functions to the IOCC.	Kindly confirm our understanding.			
3	GBB No. 27.pdf, ERT 1070, 12.2.1, The Contractor shall supply all workstations and systems to combine and consolidate all E&M railway control systems along the route between CIA and Calamba to allow central integrated control of all sections of the line from Calamba to CIA from the IOCC at Mabalacat.	It is inconsistent with "12.2.5". Please delete "integrated" from 12.2.5 "Following the migration, the integrated combined consoles and displays shall cover the complete railways from Clark to Calamba."		The proposal is rejected. The CP NS-01 Contractor is required to provide an integrated system; For Operations there shall not be separate terminals in the IOCC for the N1-section.	
4	Ch.12 Integrated Operational Control Center.pdf, ERT 1071, 12.2.5, Following the migration, the integrated combined consoles and displays shall cover the complete railways from Clark to Calamba.	In order to realize "integrated combined consoles", it is reasonable to carry out and unified design. Request you to share the architecture used in NSCR (CP04) Telecommunication subsystem? - CCTV VMS (Video Management System Software) - CSS NMS (Network Management System Software) - MSMS Management Server Software - PA audio device controller and equipment vendor - GSM-R system		Both CP04 and CP NS-01 have very similar requirements regarding the systems. The Bidder shall agree on interfaces with CP04 through interface coordination.	

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		 PIDS Voice and Data system BTN system Time and Master Clock system 			
5	Part 2 – Employer's Requirements Section V1. Employer's Requirements Technical Requirements – Power Supply, (ERT- 375), 4.4.1 Switchgear, , The 69kV switchgear shall be compact module type in design, metal enclosed and suitable for outdoor installation, the 69kV switchgear shall comprise any of the following. a. Air insulated vacuum circuit breakers withdrawable type. b. Gas insulated vacuum circuit breakers withdrawable type.	As per our understanding, 69kV Outdoor SF6 conventional GIS switchgear is acceptable. Please confirm.		The Bidder's understanding is incorrect. Please refer to Annex B.	
6	Part 2 – Employer's Requirements Section V1. Employer's Requirements Technical Requirements – Power Supply, (ERT- 419), 4.1.3, Clause no. (9) TSS equipment, 115kV outdoor type,	As per our understanding, 115kV Outdoor SF6 conventional GIS switchgear is acceptable. Please confirm.		The Bidders understanding is incorrect. Please refer to Annex B.	

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	metal enclosed gas insulated or air insulated switchgear			
7	Part 2 – Employer's Requirements Section V1. Employer's Requirements Technical Requirements – Power Distribution, (ERT-476), 5.6.4 DC Battery and Charger, 1. General, The battery type, rated capacity of battery, battery charger type shall be determined by the Contractor as part of its design of works.	Please inform us if any specific requirement of 110V battery and charger configuration. Whether any redundant battery and charger is specifically required to supply for this project.		Please refer to clause 4.4.4 (1) & (2) ERT 382 & 439, clause 4.4.6 (12) 3) ERT 390 & 432
8	General - Firefighting system	We presume that Firefighting system requirement for all outdoor equipment and indoor equipment is not in this contract scope of work. Please confirm.		Please refer to GBB No. 12 Annex B Item no.16 response.
9	Volume III, Part 2, Section VI, d) Employers Drawing, DRG No. NSRP- DWG-S/B-PSS-0000, sheet no. 4 of 45	We presume that line to line voltage is 400V, line to neutral voltage is 230V. Please clarify about the 110voltage requirement.		The Bidder's understanding is correct for the line to line voltage of 400V and line to neutral voltage of 230V. For the 110V, it is for the contractor to determine based on the proposed design of substation equipments.

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	Operation Transformer 750kVA 6.6kV/400-230-110V				
10	General - Type of floor and ceiling arrangement for TSS station, Battery post, Sectioning Post	Kindly clarify the type of floor & ceiling arrangement provided for TSS station, Battery post, Sectioning Post building. It is helpful us to decide the following at inside of room, a. Panel opening (top/ bottom cable entry). Cable trench and Cable rack support arrangement		The Contractor shall interface with Civil Contractor for the type of floor and ceiling arrangement of the respective structure.	
11	General - Type of floor and ceiling arrangement for station RER/ HER	Kindly clarify the type of floor & ceiling arrangement provided for station RER/ HER building. It is helpful us to decide the following at inside of room, a. Panel opening (top/ bottom cable entry). Cable trench and Cable rack support arrangement		The Contractor shall interface with Civil Contractor for the type of floor and ceiling arrangement of the respective structure.	
12	Volume III, Part 2, Section VI, d) Employers Drawing, DRG No. MCRP- DWG-PDS-0004, Sheet no.4 of 20	We presume that Pump House-1 and Pump House-2 for Drainage system is not in this contract scope of work. Please confirm.		The Bidder's understanding is correct. The scope of work is by other contractors. The pump house-1 rating is 37kW and pump house-2 rating is 75kW.	

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		Please provide the Pump power (kW) rating.		
13	Volume III, Part 2, Section VI, d) Employers Drawing, DRG No. MCRP- DWG-PDS-0004, Sheet no.4 of 20	Please clarify the representation of "G" in the pump house drawing.		"G" is for Generator.
14	Volume III, Part 2, Section VI, d) Employers Drawing, DRG No. NSRP- DWG-A/M-PSS-0009, Sheet no.13 of 45	In tender drawing, all distribution transformer primary and secondary winding indicated as Delta connection. Please clarify whether the contractor can propose the transformer winding configuration either of Delta or Star. Also, clarify the grounding requirement in the Delta connection system.		This is a conceptual design. The Bidder can propose transformer configuration taking into considertion the utility companies requirements and submit for approval of the Engineer. The grounding requirements shall be as industry practice and in accordance to the relevant standard.

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15	 i). Vol 2, Part 2, Section VI, Technical Requirements – Power Supply ii). Volume III, Part 2, Section VI, d) Employers Drawing. DRG No. MCRP- DWG-C/M-PSS-2001, NSRP-DWG- B/C-PSS-0018, i). (ERT-376) ii). Sheet no.4 to 16, 33 of 40 and Sheet no. 4 to 22 of 45, i). 4.4.1 Switchgear, 4)d. ii) Drawings, i). d. Rated short circuit breaking and making capacity: to meet the 69kV/6.6kV system fault level not less than 50kA. 	69kV fault level mentioned as 50kA in ERT clause 4.4.1 whereas in all SLD's 40kA is indicated. We wish to bring your kind notice both clauses are contradicting with each other. We will follow the 69kV switchgear fault level as 40kA as per SLD. Please confirm.		Please refer to GBB17 Annex A Item 5 response.	

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	VCBR1 69.0kV-1000A 40kA DSRB1 69.0kV-1000A 40kA CT× 2 CT× 2			
16	 i). Vol 2, Part 2, Section VI, Technical Requirements – Power Supply ii). Vol 2, Part 2, Section VI, Technical Requirements – Power Supply , i). (ERT-376) ii) (ERT-420), i). 4.4.1 Switchgear, (2) 69kV Switchgear, 7 	As per our understanding, 69kV & 115kV Outdoor SF6 conventional GIS switchgear is acceptable. Please confirm.		The stated IEC standard refers to Guidance on quantifying greenhouse gas emission reductions. SF6 free technology (eco- friendly) has been introduced to the market more than five years ago as an alternative to the conventional SF6 GIS Switchgear. We presume that the bidder will comply for environmental reasons.

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	 ii). 4.1.3 Switchgear, (9) TSS equipment - 115kV Switchgear, 6, i) Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems shall be considered in accordance with IEC TR 62726. ii) Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems shall be considered in accordance with IEC TR 62726. 					
17	 i) Part 2 – Employer's Requirements Section V1. Employer's Requirements Technical Requirements, (ERT-368), 10) TSS equipment, 69kV outdoor type, metal enclosed gas insulated or air insulated switchgear (eco-friendly type) ii) GBB No. 27, Annex A, Item No.49, 	As per our understanding, 69kV & 115kV Outdoor SF6 conventional GIS switchgear is acceptable. Please confirm.		The Bidders understanding is incorrect. Please refer to Annex B.		

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	i) (ERT-368) ii) Item no. 49, i) 10) TSS equipment ii) -, i) 69kV Switch gears: 69kV outdoor type, metal enclosed gas insulated or air insulated switchgear (eco-friendly type) ii) The Bidder's understanding is incorrect. Eco-friendly or eco- efficient type applies both for gas insulated or air insulated switchgear as an added benefit of reduced environmental impact.			

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18	Volume III, Part 2, Section VI, d) Employers Drawing, DRG No. NSRP- DWG-S/B-PSS-0000, NSRP-DWG- BLU-PDS-0007, sheet no. 4 of 45	As per our understanding, the provided operation transformer rating (power supply system and power distribution system) is specified to feed the Indoor building lighting loads, air conditioning loads and elevator loads of buildings, which are part of another contract scope (Civil scope). So we can use given tender drawings transformer rating to base our offer. Please confirm our understanding. If this detail is to be finalized during execution stage with CP NS-01 Contractors risk under this contract, we request DOTr to furnish the indoor lighting, air conditioning and elevator load information for power supply and power distribution system. It is helpful us to finalize the operation transformer rating		The Bidder's understanding is incorrect. The operation transformer will supply power to Substation's control equipment and other auxiliary loads. The details of other load information requested is an interface works by the NS01 contractor with the civil contractor.	
19	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, ESMP-38, SR-58, The entire construction and glazing of the PSD System shall withstand the pressure from non- stop train and the wind pressure from tropical storm.	Please confirm that based on Philippine standards NSCP2001 Zone 2 the maximum wind load to be considered is 1500Pa.		Please refer GBB 27, Annex A, item 67	

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20	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, ERT-1044, 10.9.3.1 (b)- Platform Edge, 1. To install the bottom support within the platform edge recess (about 50- 150mm from FFL, varies between stations) width	We understand that the floor around the bottom support will be finished by civil contractor for half height PSD? While for full height PSD, a recess of 50mm is very small and recess of 120-150mm will be preferable. Kindly confirm.		The Contractor shall interface with Civil contractors for the requirement.	
21	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, ERT-1034, 10.5.1 -(12), The PSD structure shall be designed to accommodate all horizontal movements over the civil structure expansion joints on the platform.	As per our specialist subcontractor, there are usually 3 horizontal movement to be planned and designed underneath PSD Fixed Panel area. Please confirm understanding.		The Contractor shall propose arrangements to be considered at design stage to the Engineer for approval.	
22	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, ERT-1045, 10.9.3.1 (b)- Electrical Requirement, 1. Power requirements (not exceed 27.5 KVA per station of two (2) platforms)	With this power requirement, it will not be possible to operate 2 platforms in the exact same time, a small delay will occur. Please confirm our understanding.		The system shall comply to performance parameters specified in the BD.	
23	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, ERT-1023, 10.3.1 (9), Each fully equipped door-	Please confirm if asymmetrical door design is acceptable for the first and second PSD door		The Contractor shall propose arrangement to be considered, after due interface with other contractors/systems, with	

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	set shall consist of bi-parting, power operated sliding screen doors. The sliding screen doors shall be synchronously controlled throughout the length of the platform. The sliding screen doors shall provide a clear opening 2000mm to match with different train door positions taking into consideration of the train stopping accuracy.	next to driver door. This is to accommodate the smaller door pitch between train door 1 &2.		justification, at design stage, to the Engineer for approval.
24	4 CP NS-01 BD Draft Part 2 Vol.2 EM Version 11 FINAL REV A, Train layout	Please confirm if the driver can exit through passenger door as based on actual train layout and train stopping tolerance. Or we need to provide separate PSD door for the driver door.		Please refer to clause ERT 10.1.4 (2) b)
25	Volume II of IV – PART 2 Employer's Requirements, ERT, ERT 941, N41.02 Shunting Locomotive (Engine Type) Clause No. 2.2, Contractor shall supply diesel locomotives (2 units) along with one flat car suitable for mainline operations having	For recovery of failed train at 315t, kindly confirm that the requirement is to be met by using 2 units of diesel locomotives in a combination for the rescue.		Rescue of a failed trainset at 315t, can be met by using two (2) units of Diesel locomotives in tandem operation. Contractor shall design as per the requirement at the stages of the Project for Engineer's approval.

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26	maximum 2.95m wide, to recover failed train, 315t, on 3.5% gradient. Locomotives should be able to work in both single and in multiple mode as a consist of two locomotives as per the operational requirement. Part 2 – Employer's Requirements Section V1. Employer's Paquirements	Kindly confirm the design of Rolling Stock air conditioner has a heating mode.		Please refer to Annex B.
	Technical Requirements -Depot Facilities, ERT 831, N18.04 Air Conditioner Testing System, Clause 2.2, Performance test shall be performed in cooling mode and heating mode.	Kindly clarify if the performance test for heating mode is required.		
27	Part 2 – Employer's Requirements Section V1. Employer's Requirements Technical Requirements -Depot Facilities, ERT 868, N20.10 Axle Lathe, Clause 2.2, The axle lathe shall accommodate axle assemblies with and without wheels, gear boxes	Kindly confirm that the machining of the axle is to be performed with the gear box installed. Also request you to advise on the standard of the finishing to be achieved by the machining.		The Contractor shall interface with the RS contractor to confirm the performance requirement of the Axle Lathe. Standard of the finishing to be achieved by machining of the Axle shall be designed at the stages of the Project for Engineer's approval.

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	and/or other wheel set components installed.			

Annex B

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Annex B

ITEM NO.	REFERENCE/CLAUSE/ SECTION	REVISIONS / AMENDMENTS
		Volume II Part 2 – Employer's Requirements
1	ERT 376 Clause 4.4.1 (2) (3)	inserted; "(eco-friendly type)."
2	ERT 419 Clause 4.1.3 (9) (1)	inserted; "(eco-friendly type)."
3	ERT 426 Clause 4.4.1 (2) (3)	inserted; "(eco-friendly type)."
4	ERG 96 clause 21.3.21	The below definition has been deleted : "(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."
5	ERG 101 clause 22.11	Clause amended on number of license requirements: The Contractor shall provide a minimum of 17 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.

6	ERG 82, Clause 19.6	New Clause added. 19.6 Permit and Permit Applications
		For all equipment, electrical supplies, and buildings containing electrical equipment the contractor shall be responsible for filing all applications for permits from utility suppliers and Local Government Unit's. The contractor shall also be responsible for paying all fees associated with the permit applications
7	Chapter 8, Part A of Appendix 8 1, N18 04 Air	Revised description of N18.04 Air Conditioner Testing Equipment to read as:
	Conditioner Testing	2.2 Performance test shall be performed in cooling mode.
	Page ERT-831	2.4 (vii) deleted
8	Chapter 8, Part A of Appendix 8.1, N02.01	Revised 4.2 clause of N02.01 10/3t Overhead Traveling Crane to read as:
	10/3t Overhead	4.2 Crane rails shall be included in crane supply and install scope and shall be
	Traveling Crane, Page ERT-740	to the runway beams which are to be supplied and installed by Building Contractor. interfaced
9	Chapter 8, Part B of Appendix 8 1, S02 01	Revised 4.2 clause of S02.01 10/3t Overhead Traveling Crane to read as:
	10/3t Overhead	4.2 Crane rails shall be included in crane supply and install scope and shall be
	Traveling Crane,	to the runway beams which are to be supplied and installed by Building Contractor.
	Page ERT-972	interfaced
10	ERT 464 Clause 5.1.2 (11)(2)	deleted "RER, HRR" and replaced with "Station electrical room"
11	ERT 502 Clause 5.1.2	deleted "RER, HRR" and replaced with "Station electrical room"
	(11)(2)	
	Volume III P	art 2 – Employer's Requirements d) Employer's Drawings
12	MCPR-DWG-X/X-OCS- 0019	Overhead Contact System Pole and Guy Foundation Diagram At Depot
13	NSRP- South-DEG-X/X-	Overhead Contact Line System Standard Pole Foundation and Guy Wire Foundation in
	OCS-0011	At Grade Section

Annex B – Attachment 1

and

69kV circuit breaker units for protecting rectifier transformer.

- 2) Each of 69kV switchgear with circuit breaker shall be designed with adequate current ratings and short circuit braking duty according to its intended function.
- The 69kV switchgear shall be compact module type in design, metal enclosed and suitable for outdoor installation, the 69kV switchgear shall comprise any of the following.
 - a. Air insulated vacuum circuit breakers withdrawable type (eco-friendly type).
 - b. Gas insulated vacuum circuit breakers withdrawable type (eco-friendly type).
- 4) The 69kV switchgear shall be designed for the following minimum ratings and not exceed 2.5 p.u. overvoltage for any switching or breaking duty:
 - a. Rated voltage: 69kV
 - b. Number of phases: 3
 - c. Rated frequency: 60Hz
 - d. Rated short circuit breaking and making capacity: to meet the 69kV/6.6kV system fault level not less than 50kA
 - e. Rated current: 630A
 - f. Auxiliary power supply voltage for operating device: 105V DC
 - g. Auxiliary power supply voltage for auxiliary circuit: 400/230V AC
- 5) The 69kV switchgear shall include the following equipment:
 - a. Circuit breaker which can withdraw or fix mounted circuit breakers;
 - b. Earthing switches;
 - c. Current transformers of suitable ratings and temperature class for protection and measuring; and
 - d. Voltage transformers of suitable ratings and temperature class for protection and measuring.
 - e. Lightning arrestor shall be installed with adequate specification in accordance with the Philippine Electrical Code.
- 6) Protection and measuring facilities shall include the following:
 - a. 69kV bus zone protection relays shall be provided;
 - b. Voltmeter and under-voltage protection for bus sections shall be provided; and
 - c. Ammeter, kilowatt meter, over-current and earth fault protection for rectifier circuits.
- Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems shall be considered in accordance with IEC TR 62726.
- (3) DC Switchgear
 - 1) DC switchgear comprising DC high speed circuit breakers shall be provided for switching off the rectifier DC incoming feeds and outgoing feeds to overhead contact

4.4 Technical Requirements

- 4.4.1 Switchgear
 - (1) Standards

All 69kV and high voltage switchgear shall be designed and manufactured in accordance with the requirements of applicable Philippine Standards equivalent to IEC 62271, High-Voltage Switch gear and Control gear or equivalent as appropriate.

- (2) 69kV Switchgear
 - 1) 69kV switchgear for TSS shall include the following:

69kV incoming circuit breaker units for ordinary feeders and/or for standby feeders, and

69kV circuit breaker units for protecting rectifier transformer.

- 2) Each of 69kV switchgear with circuit breaker shall be designed with adequate current ratings and short circuit braking duty according to its intended function.
- 3) The 69kV switchgear shall be compact module type in design, metal enclosed and suitable for outdoor installation, the 69kV switchgear shall comprise any of the following.
 - a. Air insulated vacuum circuit breakers withdrawable type (eco-friendly type).
 - b. Gas insulated vacuum circuit breakers withdrawable type (eco-friendly type).
- 4) The 69kV switchgear shall be designed for the following minimum ratings and not exceed 2.5 p.u. overvoltage for any switching or breaking duty:
 - a. Rated voltage: 69kV
 - b. Number of phases: 3
 - c. Rated frequency: 60Hz
 - d. Rated short circuit breaking and making capacity: to meet the 69kV/6.6kV system fault level not less than 50kA
 - e. Rated current: 630A
 - f. Auxiliary power supply voltage for operating device: 105V DC
 - g. Auxiliary power supply voltage for auxiliary circuit: 400/230V AC
- 5) The 69kV switchgear shall include the following equipment:
 - a. Circuit breaker which can withdraw or fix mounted circuit breakers;
 - b. Earthing switches;
 - c. Current transformers of suitable ratings and temperature class for protection and measuring; and
 - d. Voltage transformers of suitable ratings and temperature class for protection and measuring.
 - e. Lightning arrestor shall be installed with adequate specification in accordance with the Philippine Electrical Code.
- 6) Protection and measuring facilities shall include the following:

1) 115kV Switchgear

115kV Outdoor type, metal enclosed gas insulated or air insulated switchgear (eco-friendly type);

2) Rectifier equipment

115kV/1180V Gas insulated or oil insulated self-cooling type Rectify transformer;

1500V 6000kW, 12 pulses pure water heat pipe cooling type,

AC Bus duct or cable connection between Rectifier Transformer and Rectifier DC 1500V outdoor type metal enclosed air insulated switchgear with high-speed circuit breaker and disconnecting switches

115kV/1180V rectifier transformer for TSS No.1 Substation shall be Gas insulated transformer or non-flammable oil insulation transformer, in-door type and eco-friendly type.

1500V 6000kW Rectifier for TSS No.1 Substation shall be natural cooling type or heat pipe cooling type, 12 pulses, in-door type and eco-friendly type.

3) Distribution Transformer

The 115kV/6.6kV distribution transformers shall be gas insulated or oil insulated selfcooling, out-door type and eco-friendly type whilst the 115kV/6.6kV distribution transformers for TSS No.1 Substation shall be Gas insulated or non-flammable oil insulation transformer, in-door type and eco-friendly type.

AC 6.6kV power distribution equipment to NSRP-South Substations shall be metalclosed type, out-door type and eco-friendly type whilst the AC 6.6kV power distribution equipment for TSS No.1 Substation shall be metal-closed type, in-door type and eco-friendly type.

4) DC 1500V Indoor type air insulated switchgear.

 $\rm DC$ 1500V Switch gears Indoor type air insulated switchgear with disconnecting switches.

DC 1500V Indoor type air insulated switchgear for Rectifier positive protection.

DC 1500V disconnecting switches for Rectifier Negative separation.

DC 1500V Indoor type air insulated switchgear for Re-Generating Resistor.

5) Re-generating power absorbing equipment

The power absorbing equipment shall be consisting of the following;

a) Resistor compartment

- b) Regenerative chopper (IGBT based) and smoothing capacitor compartment
- c) DC reactor, high speed DC circuit breaker and disconnection switch compartment.
- Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems shall be considered in accordance with IEC TR 62726.
- (10) Harmonics
 - The power supply design shall comply with the maximum of total permissible voltage distortion of MERALCO requirements for limitation of higher harmonics at the 115 kV termination points to the MERALCO's grid.

supply through other side line.

- 3) One circuit for each direction in looped system distribution line is prepared for Electric rooms.
- 4) Distribution transformer 115kV/6.6kV are prepared in the substations and listed in Chapter 5, and in depot exclusive use two Distribution transformers are designed.
- (9) TSS equipment
 - 1) 115kV Switchgear

115kV Outdoor type, metal enclosed gas insulated or air insulated switchgear (ecofriendly type);

2) Rectifier equipment

115kV/1180V Gas insulated or oil insulated self-cooling type Rectify transformer;

1500V 6000kW, 12 pulses pure water heat pipe cooling type,

AC Bus duct or cable connection between Rectifier Transformer and Rectifier DC 1500V outdoor type metal enclosed air insulated switchgear with high-speed circuit breaker and disconnecting switches

115kV/1180V rectifier transformer for_TSS No.1 Substation shall be Gas insulated transformer or non-flammable oil insulation transformer, in-door type and eco-friendly type.

1500V 6000kW Rectifier for_TSS No.1 Substation shall be natural cooling type or heat pipe cooling type, 12 pulses, in-door type and eco-friendly type.

3) Distribution Transformer

The 115kV/6.6kV distribution transformers shall be gas insulated or oil insulated selfcooling, out-door type and eco-friendly type whilst the 115kV/6.6kV distribution transformers for_TSS No.1 Substation shall be Gas insulated or non-flammable oil insulation transformer, in-door type and eco-friendly type.

AC 6.6kV power distribution equipment to NSRP-South Substations shall be metalclosed type, out-door type and eco-friendly type whilst the AC 6.6kV power distribution equipment for TSS No.1 Substation shall be metal-closed type, in-door type and eco-friendly type.

4) DC 1500V Indoor type air insulated switchgear.

 $\rm DC$ 1500V Switch gears Indoor type air insulated switchgear with disconnecting switches.

DC 1500V Indoor type air insulated switchgear for Rectifier positive protection.

DC 1500V_disconnecting switches for Rectifier Negative separation.

DC 1500V Indoor type air insulated switchgear for Re-Generating Resistor.

5) Re-generating power absorbing equipment

The power absorbing equipment shall be consisting of the following;

a) Resistor compartment

- b) Regenerative chopper (IGBT based) and smoothing capacitor compartment
- c) DC reactor, high speed DC circuit breaker and disconnection switch compartment.

Philippine Electrical Code

Philippine Distribution Code

Philippine Grid Code

National Structural Code of The Philippines

National Building Code of The Philippines

Proposals for the adoption of alternative standards shall be submitted to the Engineer for review.

4.4 Technical Requirements

- 4.4.1 Switchgear
- (1) Standards

All high voltage switchgear shall be designed and manufactured in accordance with the requirements of applicable Philippine Standards equivalent to IEC 62271, High-Voltage Switch gear and Control gear or equivalent as appropriate.

- (2) 115kV Switchgear
 - 1) 115kV switchgear for TSS shall include the 115kV incoming circuit breaker units for ordinary feeders and/or for standby feeders.
 - 2) Each of 115kV switchgear with circuit breaker shall be designed with adequate current ratings and short circuit braking duty according to its intended function.
 - 3) The 115kV switchgear shall metal enclosed and suitable for outdoor installation. The 115kV switchgear shall comprise any of the following:
 - a. Air insulated vacuum circuit breakers withdrawable type (eco-friendly type).
 - b. Gas insulated vacuum circuit breakers which can withdraw type (eco-friendly type).
 - 4) The switchgear shall be designed for the following minimum ratings and not exceed 2.5 p.u. overvoltage for any switching or breaking duty:
 - a. Rated voltage: 115kV
 - b. Number of phases: 3
 - c. Rated frequency: 60Hz
 - d. Rated short circuit breaking and making capacity: to meet the 115kV system fault level not less than 40kA
 - e. Rated current: 1,250A
 - f. Auxiliary power supply voltage for operating device: 105V DC
 - g. Auxiliary power supply voltage for auxiliary circuit: 400/230V AC
 - 5) The 115kV switchgear shall include the following equipment:

IEC 62278 (Clause 3.2.2)	Railway Applications-Specifications and demonstration of reliability, availability, maintainability and safety (RAMS)
IEC TR 62726	Guidance on quantifying greenhouse gas emission reductions
IEEE 519 (Clause 5.3.5, 5.4.5)	IEEE recommended practices and Requirements for Harmonic Control in Electrical Power Systems
BS 6651 (Clause 5.7.4)	Code of practice for protection of structures against lightning
EN 50122-1	Railway applications Fixed installations Electrical safety, Earthing and the return circuit.
Philippine Electrical Code	
Philippine Distribution Code	

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Proposals for the adoption of alternative standards shall be submitted to the Engineer for review.

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 - a. Air insulated vacuum circuit breakers withdrawable type (eco-friendly type).
 - b. Gas insulated vacuum circuit breakers which can withdraw type (eco-friendly type).
 - 4) The switchgear shall be designed for the following minimum ratings and not exceed

- 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:

Percentage Availability = $MTBF / (MTBF + MTTR) \times 100\%$

Where:

- (1) MTBF (Mean Time Between Failure) of an element is the average time (usually expressed in hours) an element works without failures. It is calculated by dividing the total number of operating hours by the total number of failures;
- (2) MTTR (Mean Time To Restore) is the mean active repair time required, after arrival of the maintenance team, to locate and isolate the fault, make repairs, and perform a functional checkout to verify that the equipment has been restored to operational status. It is calculated as the total active repair time divided by the total number of failures requiring corrective maintenance. This classification excludes preventive maintenance downtime, logistic delays, supply delays and administrative delays;
- 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

- 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.

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- (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.

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

- **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 17 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:

- **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 <u>10-17</u> 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.

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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.

19.6. Permits and Permit Applications

For all equipment, electrical supplies, and buildings containing electrical equipment the contractor shall be responsible for filing all applications for permits from utility suppliers and Local Government Unit's. The contractor shall also be responsible for paying all fees associated with the permit applications.

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

meetings shall commence from the time the O&M Concessionaire is appointed until the end of the Defects Notification Period.

20.4.19.4. 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.

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21.20. INTERFACE MANAGEMENT

21.1.20.1. 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.

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N18.04 Air Conditioner Testing System

- 1. Quantity: One (1) set
- 2. Functional Requirements
- 2.1. The air conditioner testing system shall be provided for testing the performance of the air conditioner removed from the train car.
- 2.2. Performance test shall be performed in cooling mode.
- 2.3. For the cooling test, the enclosed test room shall be heated up to 40 deg.
- 2.4. Air conditioner performance shall be checked by measuring the following items, but not limited to:
 - i. Compressor current (A),
 - ii. Ventilator current (A),
 - iii. Ambient air temperature (deg.),
 - iv. Discharge air temperature (deg.),
 - v. Temperature difference between intake and discharge (deg.),
 - vi. Discharge air velocity (m/sec.),
- 2.5. Measured data and calculated result shall be recorded in the control panel and can be downloaded to USB.
- 3. Design
- 3.1. The air conditioner testing system shall be composed of, but not limited to:
 - i. Control panel,
 - ii. Measuring instruments, sensors,
 - iii. Test room of bellows type,
 - iv. Hot air generator,
 - v. Air conditioner bench.
- 3.2. Arrangement of the air conditioner testing system shall be referred to the workshop layout drawings.
- 4. Interface Requirement
- 4.1. Interface shall be taken with the Rolling Stock Contractor regarding the technical particulars of the air conditioner.
- 4.2. Interface shall be taken at the appropriate timing with the Building Contractor regarding, but not limited to:
 - i. Floor anchor work, installation work,
 - ii. Electric power source, distribution box, cabling, etc.
- 5. Eligible Supplier

N18.04 Air Conditioner Testing System

- 1. Quantity: One (1) set
- 2. Functional Requirements
- 2.1. The air conditioner testing system shall be provided for testing the performance of the air conditioner removed from the train car.
- 2.2. Performance test shall be performed in cooling mode-and heating mode.
- 2.3. For the cooling test, the enclosed test room shall be heated up to 40 deg.
- 2.4. Air conditioner performance shall be checked by measuring the following items, but not limited to:
 - i. Compressor current (A),
 - ii. Ventilator current (A),
 - iii. Ambient air temperature (deg.),
 - iv. Discharge air temperature (deg.),
 - v. Temperature difference between intake and discharge (deg.),
 - vi. Discharge air velocity (m/sec.),
 - vii. Heater current (A).
- 2.5. Measured data and calculated result shall be recorded in the control panel and can be downloaded to USB.
- 3. Design
- 3.1. The air conditioner testing system shall be composed of, but not limited to:
 - i. Control panel,
 - ii. Measuring instruments, sensors,
 - iii. Test room of bellows type,
 - iv. Hot air generator,
 - v. Air conditioner bench.
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 - i. Floor anchor work, installation work,
 - ii. Electric power source, distribution box, cabling, etc.
- 5. Eligible Supplier

N02 UNSCHEDULED REPAIR SHOP

N02.01 10/3t Overhead Travelling Crane

- 1. Quantity: One (1) set of crane
- 2. Functional Requirements
- 2.1. The crane shall be used for transferring parts/equipment on the train, bogie and bogie components.
- 2.2. The crane shall be provided in the N02 Un-scheduled Repair Shop.
- 2.3. Crane performance shall be as follows:
 - i. Lifting capacity: Two hoists, 10 tons and 3 tons,
 - ii. Travelling distance: approx. 70 m,
 - iii. Traverse distance (between center of crane rails): approx. 14 m,
 - iv. Lifting height: approx. 8.5 m,
 - v. Lift speed: maker's standard (reference, 5 & 0.5 m/min.),
 - vi. Traverse speed: maker's standard (reference, 2.5~12.5 m/min.),
 - vii. Travel speed: maker's standard (reference, $5 \sim 25$ m/min.).
- 3. Design
- 3.1. The crane shall be of single or double girder type with catwalk on it.
- 3.2. Operation and control on a pendant shall be applied, on which an emergency stop button shall be provided.
- 3.3. Jogging function for lifting shall be provided.
- 3.4. Motor insulation class F, Dust/Water Protection: IP 55
- 3.5. Flashing light (orange color) shall be provided for work safety.
- 3.6. Safety devices shall be integrated for overload, highest/lowest limit switch, etc.
- 3.7. Magnetic disc brake shall be provided.
- 3.8. The crane shall be equipped with anti-collision device.
- 3.9. The following lifting tools shall be provided:
 - i. 2 sets of lifting gear for lifting bogie (approx. 3.0 m x 2.7 m, < 10 tons)
 - ii. 2 sets of lifting ropes, shackles and slings (for 1 ton 3 tons, <3 tons)
- 4. Interface Requirement
- 4.1. The Contractor shall provide and install the crane in the workshops, with appropriate interface coordination with the between Building and OCS Contractors, regarding material supply, power conductor rail layout, capacity, control and interlocking arrangements and installation work.
- 4.2. Crane rails shall be included in crane supply and install scope and shall be interfaced to the runway beams which are to be supplied and installed by Building Contractor.
- 4.3. Power conductor rails will be installed by the crane supplier.
- 5. Eligible Supplier

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- 2. Functional Requirements
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- 2.3. Crane performance shall be as follows:
 - i. Lifting capacity: Two hoists, 10 tons and 3 tons,
 - ii. Travelling distance: approx. 70 m,
 - iii. Traverse distance (between center of crane rails): approx. 14 m,
 - iv. Lifting height: approx. 8.5 m,
 - v. Lift speed: maker's standard (reference, 5 & 0.5 m/min.),
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- 4.1. The Contractor shall provide and install the crane in the workshops, with appropriate interface coordination with the between Building and OCS Contractors, regarding material supply, power conductor rail layout, capacity, control and interlocking arrangements and installation work.
- 4.2. Crane rails shall be included in crane supply and install scope and shall be interfaced supplied to the runway beams which are to be supplied and installed by Building Contractor who will install it on the building beams.
- 4.3. Power conductor rails will be installed by the crane supplier.
- 5. Eligible Supplier

S02 UNSCHEDULED REPAIR SHOP

S02.01 10/3t Overhead Travelling Crane

- 1. Quantity: One (1) set of crane
- 2. Functional Requirements
- 2.1. The crane shall be used for transferring parts/equipment on the train, bogie and bogie components.
- 2.2. The crane shall be provided in the S02 Un-scheduled Repair Shop.
- 2.3. Crane performance shall be as follows:
 - i. Lifting capacity: Two hoists, 10 tons and 3 tons,
 - ii. Travelling distance: approx. 70 m,
 - iii. Traverse distance (between center of crane rails): approx. 14 m,
 - iv. Lifting height: approx. 8.5 m,
 - v. Lift speed: maker's standard (reference, 5 & 0.5 m/min.),
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- 4.1. The Contractor shall provide and install the crane in the workshops, with appropriate interface coordination with the between Building and OCS contractors, regarding material supply, power conductor rail layout, capacity, control and interlocking arrangements and installation work.
- 4.2. Crane rails shall be included in crane supply and install scope and shall be interfaced to the runway beams which are to be supplied and installed by Building Contractor.
- 4.3. Power conductor rails will be installed by the crane supplier.
- 5. Eligible Supplier

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- 2. Functional Requirements
- 2.1. The crane shall be used for transferring parts/equipment on the train, bogie and bogie components.
- 2.2. The crane shall be provided in the S02 Un-scheduled Repair Shop.
- 2.3. Crane performance shall be as follows:
 - i. Lifting capacity: Two hoists, 10 tons and 3 tons,
 - ii. Travelling distance: approx. 70 m,
 - iii. Traverse distance (between center of crane rails): approx. 14 m,
 - iv. Lifting height: approx. 8.5 m,
 - v. Lift speed: maker's standard (reference, 5 & 0.5 m/min.),
 - vi. Traverse speed: maker's standard (reference, 2.5~12.5 m/min.),
 - vii. Travel speed: maker's standard (reference, $5 \sim 25$ m/min.).
- 3. Design
- 3.1. The crane shall be of single or double girder type with catwalk on it.
- 3.2. Operation and control on a pendant shall be applied, on which an emergency stop button shall be provided.
- 3.3. Jogging function for lifting shall be provided.
- 3.4. Motor insulation class F, Dust/Water Protection: IP 55
- 3.5. Flashing light (orange color) shall be provided for work safety.
- 3.6. Safety devices shall be integrated for overload, highest/lowest limit switch, etc.
- 3.7. Magnetic disc brake shall be provided.
- 3.8. The crane shall be equipped with anti-collision device.
- 3.9. The following lifting tools shall be provided:
 - i. 2 sets of lifting gear for lifting bogie (approx. 3.0 m x 2.7 m, < 10 tons)
 - ii. 2 sets of lifting ropes, shackles and slings (for 1 ton 3 tons, <3 tons)
- 4. Interface Requirement
- 4.1. The Contractor shall provide and install the crane in the workshops, with appropriate interface coordination with the between Building and OCS contractors, regarding material supply, power conductor rail layout, capacity, control and interlocking arrangements and installation work.
- 4.2. Crane rails shall be included in crane supply and install scope and shall be interfaced supplied to the runway beams which are to be supplied and installed by Building Contractor who will install it on the building beams.
- 4.3. Power conductor rails will be installed by the crane supplier.
- 5. Eligible Supplier

- 1) Building works for RER, HRR and EGR including internal lighting, outlets, air conditioners and other building services.
- 2) In the main line, Station electrical room equipment including cabling between the main LV Switchgear installed by the Contractor in RER, HRR and the LV panels in <u>Station electrical roomRER, HRR</u> except for system's equipment.
- 3) In the Mabalacat Depot, Low voltage electrical room equipment including cabling between the main LV Switchgear installed by the Contractor in HER and the LV panel in the low voltage electrical room except for system's equipment.
- 4) The exhaust equipment in the exhaust stack shaft installed between the emergency generator room and the vent on the roof. (The Contractor shall install an exhaust pipe for the emergency generator between generator equipment and the exhaust stack shaft in the emergency generator room.)

5.1.3 Scope of Works

The Works to be performed by the Contractor shall include at least the following:

- 1) Design, supply, system quality management, installation, testing including integrated testing, and commissioning to complete the power distribution system;
- 2) Presentations, reviews and audit support as described in the Employer's Requirements;
- 3) Interface management with relevant Contractors;
- 4) Design, identification of locations for concrete foundations for supporting structures if necessary, floor cinder concrete, earthing terminals for RER, REH, HER and DB, concrete troughs along the track, buried pipe and manhole in the Mabalacat Depot and coordination and interfacing with relevant Contractors;
- 5) Decommissioning, removal and/or disposal of temporary works; and
- 6) Defects liability of Permanent Works after commissioning as stipulated in the Contract.

5.1.4 System Overview

(1) System Studies

- 1) AC 6.6kV power demands study;
- 2) Short circuit current, voltage drop and permissible current study;

- 1) Building works for RER, HRR and EGR including internal lighting, outlets, air conditioners and other building services.
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