

**DEPARTMENT OF TRANSPORTATION
REPUBLIC OF THE PHILIPPINES**

**METRO MANILA SUBWAY PROJECT
PHASE 1**

BIDDING DOCUMENTS

FOR

THE PROCUREMENT OF

PACKAGE CP107: ROLLING STOCK

Volume II of III

PART 2 EMPLOYER'S REQUIREMENTS

December 2019

| | |
|-------------------------|--|
| Employer: | Department of Transportation |
| Procuring Agent: | Procurement Service |
| Country: | Republic of the Philippines |
| Project: | Metro Manila Subway Project (MMSP) Valenzuela – Paranaque |
| Loan No.: | PH-P267 |

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BIDDING DOCUMENTS

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EMPLOYER'S REQUIREMENTS**

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1. SCOPE OF WORKS (SOW)

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1 SCOPE OF WORKS (SOW)

The purpose of this document is to provide the Scope of Works (SOW) for the Contractor for the procurement of the Rolling Stock. A detailed description of the SOW is provided in the Bidding Documents, Part 2 Works Requirements, Section VI Employer’s Requirements which is subdivided into the General Requirements (ERG) and Technical Requirements (ERT). Should there be any discrepancies between the SOW and the ERT, the provisions specified in the ERT shall prevail.

1.1 GENERAL

The SOW of the Contractor is to provide a Rolling Stock fleet of Thirty (30) 8-car train sets, which comprise of a total of 240 vehicles.

The SOW includes the following:

- 1) Implementation planning for the provision of vehicles;
- 2) Technical design of vehicles;
- 3) Driver’s Cab Mock-Up (including a part of saloon);
- 4) Train Operation Simulator;
- 5) Manufacturing;
- 6) Procurement of materials, components and subsystems;
- 7) Delivery of Rolling Stock and Simulator to the Site;
- 8) Testing and Commissioning of the vehicles;
- 9) Provision for spare parts and special tools for the Rolling Stock maintenance;
- 10) Provision of Rolling Stock Operation and Maintenance (O&M) Manuals;
- 11) Training of personnel;
- 12) Providing “As-Built” documentation for the vehicles;
- 13) Providing engineering service during the Defects Notification Period (DNP); and
- 14) Providing six (6) couplers and delivering them to the CP106 Contractor.

1.2 IMPLEMENTATION PLAN

Project Management Plan;

- 1) Design and Development Plan;
- 2) Inspection, Testing and Commissioning Plan; and
- 3) Any other plans and documentation that is described within the ERG and ERT.

1.3 TECHNICAL DESIGN OF ROLLING STOCK

The Contractor shall undertake the technical design for the Rolling Stock. This technical design shall include, but not limited to:

- 1) Design interfaces;
 - 2) Coordination with related systems to ensure that the trains shall meet the overall operating requirements; and
-

- 3) Technical and performance requirements in accordance with the ERT.

Design reviews shall be conducted at each stage of the design process as specified. The Contractor shall start procurement, manufacturing, construction and installation after the outcome of the Engineer’s review.

1.4 DRIVER’S CAB MOCK-UP

The Contractor shall provide a full size fully equipped Mock-up for evaluation of the Driver’s cab design and part of the saloon car as specified in Sub-Clause 1.2.7 of the ERT.

1.5 TRAIN OPERATION SIMULATOR

The Contractor shall provide a Simulator as specified in Sub-Clause 27 of the ERT. The Simulator shall be delivered to the Site and commissioned by the Contractor.

1.6 MANUFACTURING

The Contractor shall manufacture thirty (30) 8-car train sets, total of 240 vehicles. Manufacturing of the vehicles and equipment shall be carried out under accepted production and certified quality control processes to the JIS Q9001.

1.7 PROCUREMENT OF MATERIALS, COMPONENTS AND SUB-SYSTEMS

The Contractor shall procure materials, components and sub-systems which are required for the Rolling Stock manufacturing. The materials to be used in the manufacturing shall be of high quality and comply with relevant international standards acceptable to the Engineer. All materials, components and sub-systems shall be procured from reputable suppliers which are ISO 9001 certified.

1.8 INSPECTION, TESTING AND COMMISSIONING

The Contractor shall test all vehicles to ensure compliance to the specified performances in the ERT. Tests are categorized into Factory Acceptance Test (FAT), Site Acceptance Test (SAT), Testing and Commissioning.

FAT shall be conducted at the manufacturer’s facility with SAT, Testing and Commissioning being conducted after delivery to the Site.

System Integration Test (SIT) shall be conducted together with Signaling, Telecommunications and other suppliers as a part of SAT and Testing and Commissioning.

1.9 DELIVERY OF ROLLING STOCK TO THE SITE

The Contractor shall deliver the completed Rolling Stock by whichever means necessary to the Site as designated by the Engineer to meet the requirements of the Project delivery schedules and shall unload the Rolling Stock at the specified location.

1.10 PROVISION FOR SPARE PARTS AND SPECIAL TOOLS

Spare parts, consumables, special tools and diagnostic test equipment shall be provided by the Contractor for the maintenance of the Rolling Stock.

The Contractor shall submit a comprehensive list of recommended spare parts in accordance with the requirements specified in the ERG and ERT.

The Contractor shall also provide all special tools, such as diagnostic test equipment, test benches, jigs, etc. that shall be necessary for the operations and maintenance of the Rolling Stock and associated equipment.

1.11 PROVISION OF ROLLING STOCK OPERATION AND MAINTENANCE (O&M) MANUALS

The Contractor shall provide fully illustrated Operation and Maintenance (O&M) Manuals complete with the following:

- 1) Drawings;
- 2) Diagrams;
- 3) Schematics; and
- 4) Spare parts catalogues.

The maintenance manual shall be categorized as follows:

- 1) Running maintenance requirements;
- 2) Scheduled maintenance requirements; and
- 3) Overhaul maintenance requirements.

1.12 TRAINING FOR EMPLOYER’S PERSONNEL

The Contractor shall provide operational and maintenance training to the operation and maintenance staff.

Training shall be categorized as follows:

- 1) Operation staff training;
- 2) Maintenance staff training; and
- 3) Engineering staff training

Training shall include provision of all required training materials and appropriate training venues.

1.13 PROVIDING “AS-BUILT” DOCUMENTATION

The Contractor shall submit as-built documentation for the Rolling Stock and its associated equipment.

The Contractor shall submit an as-built specification which has been updated and modified from the original ERT, taking account of any changes.

All as-built documentation shall be supplied in both ‘hard’ and ‘soft’ copy format.

1.14 PROVIDING ENGINEERING SERVICE DURING THE DEFECTS NOTIFICATION PERIOD

The Contractor shall provide technical support as specified by the Engineer/Employer during the Defects Notification Period (DNP).

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2. SPECIFICATIONS
A) GENERAL REQUIREMENTS (ERG)

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1 GENERAL

1.1 INTRODUCTION

This General Requirements covers the general aspects of the Works and the requirements of Bids and Contracts, viz., submittal requirements of Design and Drawings, Management Plans, Project Planning and Progress Monitoring, Site Management, Drawings Standards, and Contractor’s Obligations for health and safety, etc. for the Metro Manila Subway Project (MMSP) Rolling Stock CP107 Package. This General Requirements shall be read in conjunction with the Bidding Procedure (Part 1 of the Bidding Documents), Works Requirements (Part 2 of the Bidding Documents), Conditions of Contract and Contract Forms (Part 3 of the Bidding Documents); and Site Data (Part 4 of the Bidding Documents). The abbreviations used in the Bidding Documents are given in Appendix A to these General Requirements.

1.1.1 Definition of the Location of MMSP

MMS operations cover approximately 36 km of service line with a total of 16 stations from Quirino Highway to FTI and from Lawton Wast to NAIA(T3).

To link with the MMS operation, an integrated transport system is envisaged with seamless transfers, i.e. unified ticketing system allowing efficient movement between lines and more intermodal stations facilitating access between the different lines and road-based transport services.

The portion of the Project to be carried out under JICA ODA loan involves the procurement of 30 new trains comprising 240 vehicles in total.

1.1.2 Definition and Purpose of the Work

The Project is identified as a priority strategic transport investment for decongesting traffic and promoting growth of other urban centers outside Metro Manila. The government’s current strategy is to expand, integrate and increase the capacity of railway services.

1.1.3 Design and Technical Criteria

It shall be considered that the alignment of MMSP including through service operation section in Manila is near the sea coast and runs through a relatively polluted air environment which may present a mildly corrosive atmosphere, in which all equipment shall continue to operate satisfactorily. The vehicle car body shall be designed to withstand the rigors of the Manila railroad environment for a period of 30 years, without major overhaul. The trains shall be designed and tested to meet the safety requirements and maintenance requirements. The design of the Rolling Stock shall be a modern state-of-the-art design that offers a smooth ride quality and fulfills all required environmental standards, particularly noise attenuation levels.

1.1.3.1 Design Deviation

Deviation from the specified requirements and standards shall be permissible only under the following very strict conditions:

- 1) The deviation shall achieve equivalent or superior level of safety and performance to the specified standards;
- 2) The deviation does not delay the procurement of the established manufacturing schedule. The Contractor shall be responsible for appropriate technical justification and to obtain the approval of related competent authorities; and
- 3) All design deviations shall be reviewed by the Engineer.

1.1.3.2 Criteria for Design Personnel

Design work shall be conducted by suitably qualified engineering personnel who possess experience in the type of works for the Project scope. The Contractor shall provide a well experienced and qualified design manager to undertake the required design works which is specified by Sub-Clause 1.1.1 of Evaluation and Qualification Criteria in Bidding Document’s Part 1 Bidding Procedures.

1.2 MOBILIZATION AND DEMOBILIZATION

1.2.1 Mobilization

Mobilization shall commence within 14 days after the date of issue of Notice to Proceed, or on the Commencement Date of Works, whichever is earlier. It shall consist of preparatory work and operations, mobilization of the design team and design activities, including but not necessarily limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the work; for the establishment of offices, buildings and other facilities necessary to commence work on project. Mobilization shall include providing prerequisite submittals prior to starting work plus all plans and programs as laid down in the Bidding Documents (Refer to Section 10.2.2 Mobilization Program).

1.2.2 Demobilization

Demobilization shall be considered as complete when all of the Contractor’s equipment, materials, personnel or anything else belonging to the Contractor, that are not required for the Defects Notification Period, have been removed from the Project Site, and all the requirements of the Contract for issue of the Taking Over Certificate of the Works have been satisfied. Demobilization shall include providing all the required submittals prior to close out of the work.

1.3 SUBMITTALS AND SUBSTITUTIONS

In the Contract Documents, the intent has been to specify the minimum acceptable quality of workmanship and materials defined by reference to recognized industry and national standards, manufacturer’s name and product, or description of required attributes and performance.

The Contractor shall ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advanced submittal of design data and other requirements, and submit for review by the Engineer.

The Contractor shall make all submittals required by the Contract Documents, and revise and resubmit as necessary to ensure compliance with the specified requirements. Individual requirements for submittals are described in pertinent sections of this General Requirements and the Technical Requirements.

Unless otherwise specified elsewhere, the Contractor shall initially supply to the Engineer two copies of all drawings, specifications and other documents required for review of the Engineer. After review of the Engineer, the Contractor shall submit an electronic and six (6) hard copies of the approved drawings, specifications and other documents for the use of the Engineer.

1.3.1 Coordination of Submittals

Prior to each submittal, the Contractor shall carefully review and coordinate all aspects of each item being submitted. The Contractor will then verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. The Contractor’s signature on each submittal certifies that this coordination has been performed.

1.3.2 Certificates of Compliance

The Contractor shall certify that all materials used in the Works comply with all specified provisions

thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found not to meet the specified requirements.

The Contractor shall show on each certification the name and location of the work, name and address of Contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of letter or company-standard forms containing all required data. Certificates shall be signed by an authorized officer of the company.

In addition to the above information, all laboratory test reports submitted with certificates of compliance shall show the date or dates of testing, the specified requirements for which testing was performed, and results of the test or tests.

The Contractor shall submit to the Engineer all certificates of compliance for products and materials as part of the submittal procedure.

Any work performed by the Contractor prior to the review of the Engineer, or before drawings and specifications are submitted and approved, shall be at the Contractor’s risk.

1.3.3 Submittal Schedule

The Contractor shall compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the Works. This schedule shall include a list of each type of item for which the Contractor’s drawings, shop drawings, certificates of compliance, materials samples, guarantees, or other types of submittals are required. Upon review by the Engineer, the Contractor shall be required to adhere to the schedule except when specifically, otherwise permitted.

The Contractor shall coordinate the schedule with all necessary sub-contractors and materials suppliers to ensure their understanding of the importance of adhering to the approved schedule and their ability to so adhere. The Contractor shall revise and update the schedule on a monthly basis as necessary to reflect the current conditions and sequences and shall submit the same to the Engineer for review. The Contractor shall submit a recovery schedule in case of delay.

1.4 STANDARDS AND CODES

When a standard or code is referred to, it shall be assumed that the current revision, on the date of bid submission is applicable, unless otherwise stated. Where no standard is identifiable, the Contractor shall apply the equivalent JIS or other proven international standard.

1.5 UNITS

All drawings and design calculations submitted with the tender, or in accordance with the requirements of the Contract, shall use the International System of Units (SI Units).

1.6 WARRANTY

The Contractor shall be responsible for any defects or failures of equipment provided due to defective design, material or workmanship. Warranty will be provided for the full Defects Notification Period from the date of issue of the Taking Over Certificate and additional time required, if any, by the Contractor for rectification of defects.

The warranty/guarantee period for special tools, test equipment, maintenance and unit exchange spares shall be the full Defects Notification Period.

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.

The Contractor shall bear 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 abroad and its return to Site after repairs. Further, shall any design modification or rectification of defects or replacement of failed component or equipment be required to any component or equipment as a consequence of failure, the period of defects notification shall recommence from the date when the modified, rectified or replaced part is re-commissioned into service. The modifications (including any further modifications required during the revised Defects Notification Period) shall be carried out free of charge. Regardless of the above, the maximum Defects Notification Period is 4 years from the date of issue of the Taking Over Certificate.

If there are any manufacturer’s warranties/guarantees for any equipment, continuing beyond the Defects Notification Period, the same shall be passed on to the Employer and in such cases the warranty/guarantee period of such equipment shall be as provided by the manufacturer.

All replacements and repairs under the warranty/guarantee shall be carried out by the Contractor promptly and satisfactorily on notification of the defects by the Engineer.

1.7 MANAGEMENT PLANS AND PROGRAM

In order to ensure satisfactory execution of the Contract, completion of Works within specified targets, and also to ensure quality in design, manufacturing and execution of work, a series of management plans shall be developed. The following plans and programs shall be developed and submitted by the Contractor for the Engineer’s review, taking into account the outline plans submitted for some of them, accompanying the Bid:

- 1) Quality Management Plan (QMP).
- 2) Site Safety Management Plan (SSMP);
- 3) System Assurance Management Plan (SAMP);
- 4) Environmental Management Plan (EMP);
- 5) Project Management Plan (PMP);
- 6) Interface Management Plan (IMP);
- 7) Inspection, Testing and Commissioning Plan (ITCP);
- 8) Detailed Works Program (Project Implementation Program);
- 9) (Not Used);
- 10) Design Submission Program;
- 11) Requirements Management Plan (RMP); and
- 12) Training Plan.

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, sequencing of activities to meet the Technical Requirements (ERT) in respect of the subjects listed.

1.7.1 Quality Management Plan (QMP)

The Contractor shall submit within 35 days from the Commencement Date of the Works a comprehensive Quality Management Plan describing the Quality Management System (QMS), which includes the information Management plan and electronic document management as per the requirements of Sub-Clauses 7.1, 7.7 & 7.9 of this document. The Contractor shall document and implement the Quality Management System that shall remain in effect during the execution of Works under the Contract.

The Contractor’s QMS shall be in compliance with JIS Q9000 for its scope of work and in compliance with the Contract. The Quality Management Plan shall include details to the quality assurance scheme and detailed QA/QC plans and documents to fully describe the system which shall operate from contract award through design, manufacturing, testing, approval, warranty and maintenance.

1.7.2 Site Safety Management Plan (SSMP)

The Contractor shall submit within 42 days from the Commencement Date of the Works, a comprehensive Site Safety Management Plan (SSMP) as per the requirements of Sub-Clause 4.4 of this document for the Engineer’s to review, which shall include, but not limited to a site plan which contains the office detail, workplace and facilities on Site, a hazard analysis plan, fire control program, evacuation procedure, details of PPE, chain of reporting and all pertinent details. Ensuring hazards are rapidly identified and actions are taken to minimize risks to personnel, equipment & materials, together with detailing methods of reporting and continuous improvement. The SSMP shall follow the Philippines’ Department of Labor and Employment (DOLE) Occupational Health and Safety (OH&S) standards and any other applicable local and international statutory regulations and requirements.

1.7.3 System Assurance Management Plan (SAMP)

The Contractor shall submit within 42 days from the Commencement Date of the Works, a comprehensive System Assurance Management Plan (SAMP) which Shall contains all requirements as per Section 8 of this document, for the Engineer’s reviews.

The SAMP shall be certified by the Contractor’s internal department or by a third-party independent engineer. The SAMP shall be specifically developed for this Contract. The SAMP shall address the performance and safety of the Rolling Stock.

1.7.4 Environmental Management Plan (EMP)

The Contractor shall submit within 42 days from the Commencement Date of the Works a comprehensive Environmental Management Plan (EMP), as per the requirements of Sub-Clause 3.3 of this document, for the Engineer’s review. The Contractor shall describe how different climatic aspects are dealt with, including noise, to ensure compliance.

1.7.5 Project Management Plan (PMP)

The Contractor shall submit within 28 days from the date of Commencement of the Works, a comprehensive Project Management Plan (PMP) as per the requirements of Sub-Clause 10.1.1 of this document.

1.7.6 Interface Management Plan (IMP)

The Contractor shall submit within 42 days from the Commencement Date of the Works, a comprehensive Interface Management Plan (IMP), as per the requirements of Sub-Clause 20.11 of this document, for the Engineer’s review.

1.7.7 Inspection, Testing and Commissioning Plan (ITCP)

The Contractor shall submit within 90 days from the Commencement Date of the Works, a comprehensive Inspection, Testing & Commissioning Plan (ITCP), as per the requirements of Sub-Clause 12.2. The Contractor shall perform all necessary testing & commissioning activities in order to ensure satisfactory operation of the complete training system. The plan shall identify, inspection hold points, where work can only proceed after either review by Engineer or alternatively upon issuance of waiver of inspection by the Engineer.

1.7.8 Detailed Works Program (Project Implementation Program)

The Contractor shall submit within 28 days from the date of Commencement of the Works, a comprehensive detailed Works program (Project Implementation Program), as per the requirements of Sub-Clause 10.2.4 of this document for the Engineer’s review.

The Contractor shall revise the initial revised (baseline) detailed works program and resubmit at required intervals as required. The Contractor shall also show the mitigating initiatives to be employed to deal with any program slippage.

1.7.9 (Not Used)

1.7.10 Design Submission Program (DSP)

The Contractor shall submit within 28 days from the Commencement of the Works, a comprehensive Design Submission Program (DSP).

The Contractor shall demonstrate that quality designs can be produced in the required timescale.

1.7.11 Requirements Management Plan (RMP)

The Contractor shall submit within 28 days from the date of Commencement of the Works, a comprehensive Requirements Management Plan including the plan for a Requirements Management Database, as per the requirements of Sub-Clause 18, for the Engineer’s review. The Contractor shall describe how requirements are compared from all multiple sources and how the Verification and Validation (V&V) process will be invoked.

1.7.12 Training Plan

The Contractor shall submit a Training Plan to the Engineer within twelve (12) months from the Commencement date as per the requirements of Sub-Clause 14.4.

1.7.13 Submittal Requirements of the Management Plans

The submittal requirements and the dates by which the management plans are to be submitted for the review of Engineer are summarized in Table 1.1 below.

Table 1.1 Management Plans

| No. | Description | Reference | Submission from Commencemen |
|-----|----------------------------------|---------------------------|-----------------------------|
| | | GC, ERG, ERT | |
| 1 | Quality Management Plan | ERG 1.7.1 & 7.1, ERT 23.1 | 35 days |
| 2 | Site Safety Management Plan | ERG 1.7.2 & 4.4 | 42 days |
| 3 | System Assurance Management Plan | ERG 1.7.3 & 8 | 42 days |
| 4 | Environmental Management Plan | GC 4.18, ERG 1.7.4 & 3.3 | 42 days |
| 5 | Project Management Plan | ERG 1.7.5, 10.1.1 & 16 | 28 days |
| 6 | Interface Management Plan | ERG 1.7.6, 2.3 & 20.11 | 42 days |

| No. | Description | Reference | Submission from Commencemen |
|-----|---|---------------------------------------|-----------------------------|
| | | GC, ERG, ERT | |
| 7 | Inspection, Testing and Commissioning Plan | ERG 1.7.7 & 12.2, ERT 20.2.2 | 90 days |
| 8 | Detailed Works Program (Project Implementation Program) | ERG 1.7.8 & 10.2.4, ERT 22.1 | 28 days |
| 9 | (Not Used) | | |
| 10 | Design Submission Program | ERG 1.7.10 & 10.2.3 ERT 1.2 & 22.3 | 28 days |
| 11 | Requirements Management Plan | ERG 1.7.11 & 18 | 28 days |
| 12 | Training Plan | ERG 1.7.12 & 14.4 | 12 months |

1.8 SPECIFICATIONS RELATING TO THROUGH-OPERATION

Specifications relating to through-operation will be discussed to be coordinated between the Employers of each projects for compatibility of performances, operations and maintenance.

The Contractor shall refer Appendix C indicating example of agreements between each line which shall be complied by trains used for through-operation. These agreements will be coordinated by the Employers of each line. The Contractor shall recognize items shown in Appendix D as necessary specifications to be considered. The Contractor shall submit necessary documents such as drawings, manuals, etc. and materials, if needed for discussions between the Employers. Following Specifications shown shall be preliminarily prepared for discussions, but not limited to;

- a. Train Performance (traction effort, acceleration, deceleration, etc.)
- b. Detail Specifications (position of coupler and on-board antenna for CBTC/ETCS Level2, etc.)
- c. Arrangement of Cab
- d. Abnormal Operations

The Contactor shall accept results coordinated if his proposals are modified as the result of coordination.

2 THE COORDINATION AND INTEGRATION OF ELECTRICAL AND MECHANICAL EQUIPMENT

2.1 GENERAL

The Contractor shall ensure that all systems and subsystems are both physically and functionally compatible with each other, and shall work together to meet the Technical Requirements.

2.2 DOCUMENTATION REQUIREMENTS

In order to ensure the requirements of Sub-Clause 2.1 of these General Requirements, information shall be presented via two formats, namely:

- 1) The Interface Management Plan; and
- 2) Drawings as referenced in Sub-Clause 13.

2.3 INTERFACE MANAGEMENT PLAN

Please refer to Clause 20.11 for the Interface Management Plan.

3 ENVIRONMENTAL CONDITIONS AND ENVIRONMENTAL PLAN

3.1 GENERAL

The design of equipment shall take account of the climatic conditions and operating conditions as specified in this General Requirements and Technical Requirements, as appropriate.

All equipment shall be designed to perform in a satisfactory manner in the environment in which it is installed and to withstand the effects of high winds, temperature, humidity, vibration, noise, air and water pollution.

3.2 CLIMATIC CONDITIONS

The performance specification shall take into consideration the following environmental factors:

- 1) Rainfall;
- 2) Temperature range;
- 3) Wind speeds;
- 4) Topography;
- 5) Geophysical conditions;
- 6) Isokeraunic levels (lightning strikes); and
- 7) Atmospheric pollution.

In addition, there are other adverse conditions that may be applicable to the area under consideration.

The general environmental conditions in the Manila area are as follows:

3.2.1 Rainfall

During the period from 1981 – 2010, Philippine Atmospheric Geographical and Astronomical Services Administration (PAGASA) stations in the vicinity of the Project area in Ninoy Aquino International Airport (NAIA) in Pasay City and Port Area Manila recorded an annual rainfall amount of 1,767.8 millimeters (mm), and 2,103.6 mm with a total of 101 and 139 rainy days, respectively.

Increase in rainfall is normally observed during the southwest monsoon season (June, July and August) until the transition month of September, October and November in most areas of Luzon. PAGASA’s climate projections in the Philippines showed varied trends in magnitude and direction of the rainfall strongly indicating increase in the effects of southwest and northeast monsoons.

Based on the Report of the weather bureau PAGASA on Climate Change in the Philippines in February 2011, the projected seasonal rainfall change shall generally show a reduction in rainfall in most parts of the country during the summer season (March, April, May), but shall also show as increase in rainfall during the southwest monsoon season (June, July, August) until the transition season (September, October, November) in most areas of Luzon and Visayas.

Simply, this means that the usual wet seasons are expected to become wetter and the dry seasons drier all over the country. In addition, extreme rainfall events (heavy daily rainfall) may continue to become more frequent. Extreme rainfall is projected to increase in Luzon and Visayas only in 2020 and 2050.

3.2.2 Temperature

The average normal annual temperature recorded at above mentioned PAGASA stations were 27.8 °C, and 28.4 °C, in NAIA Pasay City, and Port Area Manila, respectively. Based on climate trends from PAGASA using observed data during the period 1951 – 2010, there has been an increase in annual mean temperature by 0.648 °C or an average of 0.0108 °C per year increase. The warmest months are

observed in April, May and June and the coldest months during December, January and February, with the temperature ranges of 28-30 °C and 25-27 °C.

3.2.3 Wind Speed and Direction

PAGASA weather stations recorded prevalent wind direction for the period 1981- 2010, as shown in Table 3.1. The average annual wind speed for NAIA, and Pasay City and Port Area, Manila are both 3 meters per second (mps).

Prevalent Wind Directions are indicated in the table below.

Table 3.1 Prevalent Wind Directions

| Month | PAGASA Weather Stations | |
|---------------------|-------------------------|-------------------|
| | NAIA, Pasay City | Port Area, Manila |
| January to April | E | N, E, and SW |
| May to September | W | SW |
| October to December | E | SW and N |
| Annual | E | SW |

Source: PAGASA

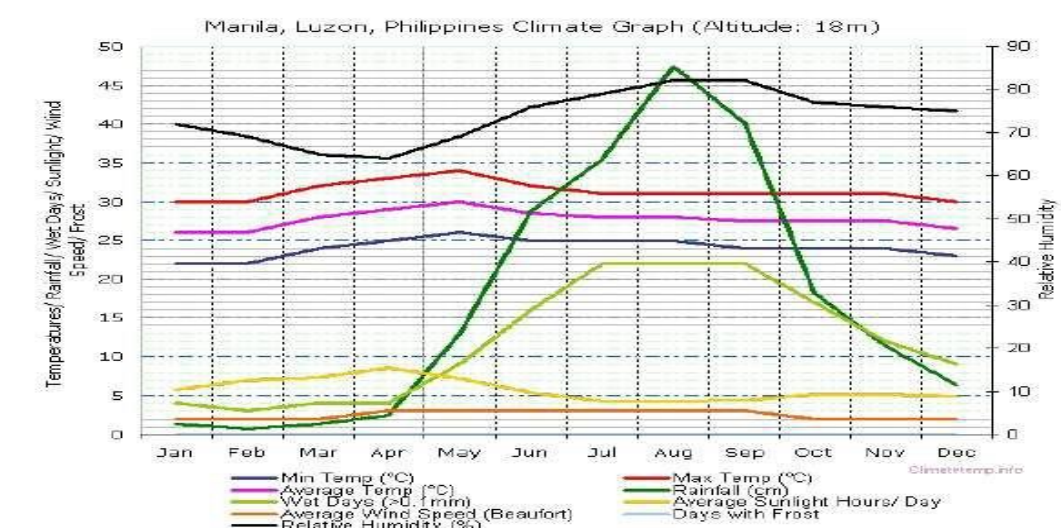
3.2.4 Humidity

The monthly relative humidity from PAGASA typically ranges from 66% to 84% over the course of the year. The average values for relative humidity were 76%, 74% and 78%, recorded at NAIA Pasay City, Port Area Manila and Science Garden Quezon City, respectively.

3.2.5 Air Quality

Monitoring data show particulate matter (PM) levels in Metro Manila that have exceeded the Air Quality Guideline Values set by the Philippine Government. Measures have been made to address the air quality problem in Metro Manila, but more needs to be done.

Most of the particulate matter collected from different sites around Metro Manila was attributed to traffic sources. Black Carbon is a major component of particulate matter samples collected in Metro Manila.



Source: Wikipedia

Figure 3.1 Meteorological Data of the Philippines (Metro Manila)

Meteorological Data of the Philippines is indicated in Figure 3.1. These figures are merely indicative, and detailed values shall be obtained from the Philippine Meteorological Services.

The Contractor’s attention is drawn to the fact that because of solar load, track bed temperatures shall reach 55 °C and temperatures inside closed boxes shall reach 70°C. Because Manila is near the bay of the South China Sea, the air is mildly corrosive atmosphere.

Manila having a dry climate for a considerable period of the year, the air frequently has high relative humidity aggravated by air pollutants (dust, etc.)

3.3 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on the outline Environmental Management Plan (EMP), the Contractor shall submit a detailed EMP illustrating the intended means of compliance with the Employer’s Requirements including noise standards for the cars 42 days after Commencement. The EMP shall state clearly the Contractor’s environmental objectives in detail and demonstrate the proposed method of achieving the environmental objectives with regard to the requirements of the Contract.

4 HEALTH AND SAFETY

4.1 INTRODUCTION

The Employer places particular emphasis on high standards of health and safety. The purpose of this section is to provide information requirements that shall apply to the Contractor.

In addition to the risks and hazards normally associated with construction works, the railway environment is particularly dangerous with the risk of serious injury from electrocution or being struck by moving trains. Because of these hazards, the Employer has to developed strict rules and operating procedures and associated training requirements with which all persons working on or about the MMSP Line and the track must comply with in the interests of their own safety and the safety of others.

The Contractor shall point out in a timely manner to the Engineer the risks associated with both the basic assumptions of the Project and the technical requirements innate in the construction. The Contractor shall take into consideration when planning the Project general principles governing labor hazard prevention adapted to fit the Project, and in particular:

- 1) Elimination of risks;
- 2) Addressing risks at their source;
- 3) Evaluation of risks that are unavoidable and propose preventive measures;
- 4) Description of the working method and of any required equipment, wherever this is deemed to be necessary due to high risk during construction, railing the train, testing, adjusting or repairing;
- 5) Replacement of hazardous materials for less hazardous ones;
- 6) Priority in decision-making concerning group protection in relation to the individual protection measures;
- 7) Adjustment to technical developments; and
- 8) Projection of the performance duration of those varied works or work phases.

The planning of an administration system meant to prevent labor hazards where the various roles and duties of the project administration staff are to be mentioned, as well as the special institutions for the

prevention of professional hazard (safety engineer, safety and health at work coordinator, labor doctor, committee for the safety and health of people at work) provided by law. Also incorporated therein must be the basic safety and health procedures at work (e.g. report of labor accidents, emergencies, (use of explosives), (deletion of personnel), (medical checkups) as well as instructions for safe work, where necessary (e.g. use of means of individual protection, working at considerable height).

4.2 HEALTH AND SAFETY FILE

The Contractor shall appoint a safety engineer who shall also act as officer of safety and health issues, who assumes the responsibility to prepare the Site Safety Management Plan and the safety and health file at the design stage.

The health and safety file shall contain only the basic segments of the Project, as well as instructions and useful information in relation to health and safety issues which, possibly, may have to be taken into consideration during the subsequent phases of the design as well as during the Project’s life such as maintenance work, conversion work, cleaning, etc. For example, the instructions and details just referred to concern the safe performance of the various maintenance works, the prevention of hazards arising from the presence of the public utility networks (water supply, power supply, etc.), fire protection, etc.

It is pointed out that the Site Safety Management Plan and health and safety file constitute part of the Works and shall be submitted to the Engineer for review. It shall be updated as the works progresses and shall be available for viewing by the Engineer at any reasonable time.

4.3 GENERAL HEALTH AND SAFETY REQUIREMENTS

4.3.1 Legislation and Regulations

The Contractor shall be subject to penal and civil laws for all injuries of his personnel, as well as personnel of the Employer and third parties, even when the Contractor has implemented the specifications approved by the Employer. The Contractor shall perform all Works in a healthy and safe manner and in accordance with Philippine laws, Presidential Decrees, police and other regulations and directions of the Employer. If no relevant Philippine Laws, Presidential Decrees, police and other regulations exist, then the relevant standards and codes of practice and current best practice of acknowledged international codes shall apply. The Contractor shall also comply at all times with any other mandatory requirements, local safety, security, and other regulations in force and to which the Works are subject, including any requirements specified by the fire brigade.

4.3.2 Contractor's Obligations

The Contractor shall ensure the safety of all operations in connection with the Project and shall take all necessary action to ensure the safety of all persons who may be working on site or adjacent to the Site, including the Employer’s staff and their agents, designated contractors and utility companies.

The Contractor shall provide and maintain throughout the Project duration all protection measures necessary for the protection and safety of all persons.

The Contractor shall comply immediately with all instructions from the Engineer in respect of the safety of the Works.

The Contractor shall ensure that all personnel on the Site are properly trained and supervised to ensure their safety and the safety of others while on Site.

The Engineer shall order the immediate removal from Site of any person who in the opinion of the Engineer, fails properly to observe the provisions of the relevant legislation, regulations and rules as appropriate, and any such other statutory regulations that from time to time may be in force. Such a

person shall not under any circumstance return to the Site without the Engineer’s approval.

The Contractor shall ensure a proper and adequate health and safety provisions, including those set out in this Project are included in subcontracts placed by the Contractor. The consumption by Contractor’s personnel of alcoholic drinks or partaking of any drug or other substance that might impair proper performance of their duties on the Site is strictly forbidden. The Contractor shall establish a policy, procedures and standards for providing a workplace that is free from harassment, intimidation, and threats. This includes but is not limited to threats of violence, physical challenges to fight, stalking, attempted assault, or assaulting by or against employees, customer employees, vendors, visitors, and members of the public.

The Contractor shall have a policy of “zero tolerance” regarding violence in the workplace and shall take all reasonable steps to prevent or address any acts or threats of this nature.

4.4 SITE SAFETY MANAGEMENT PLAN (SSMP)

The Contractor shall submit a Site Safety Management (including interoperability section) Plan in English. This plan shall include the approach and structure that the detailed plan shall take and, in particular, shall address the following items:

- 1) The Contractor's Health and Safety Policy Statement;
- 2) The Contractor's organization and arrangements for health and safety, particular reference shall be made to the site arrangements and procedures for ensuring compliance with health and safety legislation, regulations, codes of practice and, where relevant, National Standards and other international standards;
- 3) Nomination of a Safety Officer reporting to Project Manager who shall have an overview of all Site safety matters. The responsibilities, qualifications, training and experience of those nominated shall be specified. The name of the Safety Officer shall be made known to the Engineer. The name, address, educational qualification, work experience and health condition of each personnel deployed for Safety, Health and Environment (SHE) jobs shall be submitted for the Engineer’s review well before the start of the work. Only after a success review by the Engineer are the safety personnel allowed to take up their roles. If any personnel leave the Project, then the same rigorous approach shall be used for their replacement;
- 4) A schedule of safety procedures to be used on the Project, including those related to the maintenance and safe operation of Contractor's Equipment;
- 5) The Contractor's procedures for reporting and investigating accidents, dangerous occurrences or occupational illness;
- 6) The Contractor's policy and procedures for identifying and eliminating Site hazards. Reference shall also be made to mitigating measures which include procedures for the identification of the need for, and the provision of, Personal Protective Equipment (PPE), permits systems, safety rules and safety training;
- 7) The Contractor’s Health and Safety Inspection and Audits procedure to verify whether the Health and Safety plan and objectives are being met. The inspection is purposely to identify any at-risk behaviors and conditions so that corrective measures can be implemented to eliminate or minimize associated potential hazards. This procedure also defines the type and frequency of Health Safety and Environment Safety inspections and Audits needed to meet Employer’s Requirements;
- 8) The Contractor's emergency plan referred in Sub-Clause 4.5.1.4. The Contractor shall prepare an emergency response plan for all Work Sites as a part of the Contractor safety and health plan. The plan shall integrate the Emergency Response Plans of the Contractor and all other subcontractors. The emergency response plan shall detail the

Contractor’s procedures, including detailed communications arrangements, for dealing with all emergencies that could affect the Site. This shall include, where applicable, injury, sickness, evacuation, fire, chemical spillage, severe weather and rescue;

- 9) Proposals for ensuring a mutual understanding between the Contractor and the Employer with regard to the elimination or mitigation of hazards on Site;
- 10) Methods of integrating the Contractor and the Employer’s safe working practices and procedures and, where relevant those of designated contractors, other contractors and utility companies;
- 11) An outline program for safety tours and detailed safety inspections to identify any variation in construction activities, operations, machinery, equipment and processes against the Safety Plan and its supplementary procedures and programs;
- 12) The Contractor's disciplinary procedures with respect to safety related matters;
- 13) The Contractor's procedures for assessing the suitability of subcontractors with respect to health and safety;
- 14) The Contractor's procedures for ensuring that their personnel are medically fit for the tasks they are carrying out. The procedures shall take into account working hours and environment; and
- 15) The Contractor’s safety organizational chart.

Within forty-two (42) days from Commencement of the Works, the Contractor shall provide the Engineer with the finalized Site Safety Management Plan for his review, taking to account of any directions or requirements from the Employer on the Site Safety Management Plan submitted. Where specific requirements cannot be complied with reasons shall be stated and any alternative arrangements specified. The finalized plan shall also detail the measures that shall be implemented to eliminate or mitigate against the hazards identified and specified by the Engineer during the review submitted plan.

The Contractor shall carry out monthly reviews of the measures contained within the Site Safety Plan to demonstrate that the required levels of safety are being achieved and maintained. The Contractor shall submit a full report to the Employer and the Engineer at monthly intervals for each such review.

The Engineer shall review the Site Safety Management Plan from time to time and shall advise the Contractor of any matter with which the Engineer is not satisfied, and the Contractor shall take such steps as are necessary to rectify this situation.

The Engineer shall carry out such safety studies or audits as considered necessary.

The Contractor shall make available specialist personnel as the Engineer may consider necessary for the performance of such safety studies or audits.

4.5 SITE SAFETY REQUIREMENTS

4.5.1 Site Organization and Arrangements for Safety

- 1) Safety Supervisors

Prior to commencement of the actual Works, the Contractor shall appoint Site Safety Supervisors to provide adequate supervision, and shall supply to the Engineer the names and details of qualifications, experience and training of the persons so appointed. Before starting work, and at such other times as may be required by the Engineer, the Contractor's safety officer and safety supervisors shall meet the Engineer’s safety representative to discuss and agree the safety measures to be implemented on Site. At all times when work is being carried out on the site, the Contractor's safety officer or a nominated deputy shall be available on the site to take immediate action on all safety

matters.

2) Site Safety Committee

- a. The Contractor's safety officer or his designated representative shall attend meetings of a Site Safety Committee chaired by the Employer or Engineer, which shall meet at no less than monthly intervals. The Site Safety Committee shall also include representatives of major subcontractors, designated contractors, utility companies, other authorities (fire brigade, police, etc.) and other specialists as the Employer may decide; and
- b. The Contractor shall act without delay upon decisions or recommendations made from time to time by the site safety committee with regard to general or particular matters of health and safety.

3) Notification of Accidents

- a. In the event of any recordable accident or dangerous occurrence arising at the Site during the execution of the Works, the Contractor shall comply with the legal requirements for reporting of injuries, diseases and dangerous occurrences; and
- b. In addition to any statutory reporting, the Contractor shall report to the Employer and the Engineer, within 48 hours, any accident or dangerous occurrence involving his personnel or other parties, that occurs on the Site.

4) Emergency Procedures

The Contractor shall submit the document for review to the Engineer and including the Site Safety Management Plan detailed proposals for any reasonably foreseeable emergency, stating the procedures to be adopted for each emergency. The Contractor's emergency plan shall detail the duties and responsibilities of personnel on Site and in particular shall identify a senior site official with responsibility for liaising with the emergency services.

The emergency plan shall also include the names and telephone numbers of the Contractor's staff who would be available to organize or assist with emergency action in the event of an incident occurring on the Site outside the Contractor's normal working hours.

Approved copies of an emergency plan and procedures shall be produced by the Contractor and distributed and displayed at work place together with any other documents, posters or notices which the Employer may direct or are required by law.

Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the Contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

The Contractor shall require to liaise with the hospitals and fire stations located in the neighborhood for attending to the casualties promptly. The Contractor shall conduct an onsite emergency drill in every month for all of his workers and his subcontractor's workers before starting work on the Site. The Contractor shall ensure that all of his personnel are:

- a) Informed of the procedure for calling the Fire Brigade and other emergency services; and
- b) Informed of and understand fully the evacuation procedures from the Work site(s).

4.5.2 Personal Protection

- 1) Personal Protective Equipment (PPE)
 - a) The Contractor shall undertake a survey and needs analysis of PPE requirements for the Works and shall provide all appropriate PPE for his personnel. In addition, the Contractor shall provide 15 sets of PPE to the Engineer and Employer;
 - b) The PPEs and safety appliances provided by the Contractor shall be of the required standard. If materials conforming to standards are not available, the Contractor as approved by the Employer shall procure PPE and safety appliances as soon as possible, in liaison with the Employer;
 - c) The Contractor shall provide and enforce the wearing of approved safety helmets and footwear where necessary, eye goggles, ear protectors, safety harnesses, safety vests and other Personal Protective Equipment. The Contractor shall ensure that all persons on Site wear PPE at all times in areas where PPE is required; and

Wherever work is carried out on or near to the MMSP facilities, particularly at a carriage way, or adjacent to a public way, the Contractor shall ensure that personnel shall, at all times, wear high visibility fluorescent garments.

- 2) Permit to Work
Wherever there are potentially hazardous conditions, the Contractor shall consider whether operating a "Permit to Work" system would reduce the hazards; and

The Contractor shall secure necessary work permits where statutory requirements exist.
 - a) The Contractor shall develop a work permit system, which is a formal written system used to control certain types of work that are potentially hazardous. A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work permits form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to work are usually required in high-risk areas as identified by risk assessments.

4.5.3 Safety of Equipment of the Contractor

- 1) Contractor's Equipment, Tools, and Vehicles
 - a) The Contractor shall ensure that their own and their subcontractor's tools, equipment and vehicles required for the execution of the Works are maintained in a safe condition and are used only by trained operators; Equipment shall be examined and checked by the Contractor prior to delivery to Site or placed into service to ensure that it is operating in a safe mode;
 - b) The Contractor shall ensure that all equipment is maintained in a thoroughly serviceable condition and, where appropriate, the equipment shall be included in a preventive maintenance program or subjected to pre-use inspections. Maintenance records and programs shall be made available to the Engineer when required. Any item of tools or equipment considered by the Engineer to be unserviceable or unsafe, shall not be used and shall be removed from the Site without delay;
 - c) Where appropriate, the Contractor shall provide the Engineer with the most recent statutory inspection certificates in respect of all tools and equipment subject to statutory inspections, together with recent maintenance records for all items of equipment and tools which are being used onsite; and
 - d) The Contractor shall ensure that any noise-emitting equipment which is required to be operated continuously or at night, shall be housed in a suitable acoustic enclosure.
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The requirements of Sub-Clause 9.8 shall apply with respect to noise disturbance.

- 2) Contractor's Lifts and Hoists and Other Lifting Equipment
 - a) All hoisting facilities shall satisfy the relevant legislative requirements;
 - b) The Contractor shall operate all cranes strictly in accordance with national standards for the safe use of cranes. All cranes, hoists and the like shall be fitted with overload warning devices;
 - c) To enable the Engineer to approve the use of the crane, the Contractor shall provide, as a minimum, the following information at least 12 days before bringing a crane to the Site:
 - i) Information concerning lifting capacity at various radii;
 - ii) Wheel, track and outrigger loads under travelling and lifting conditions;
 - iii) Details of crane positioning and load delivery route required for any lifting operation;
 - iv) The dimensions and weights of the items to be lifted;
 - v) The positioning of crane outriggers and the tail swing of any counterweights;
 - vi) The proximity of the crane and the working envelope, relative to the nearest operational running line or siding, if any; and
 - vii) The orientation of the crane jib relative to any structure, running line or siding and a risk assessment of the crane jib collapsing or the crane overturning;
 - d) Competent operators and banks men shall be clearly identified and shall be in possession of current certificates of training and personal protective equipment (PPE);
 - e) The safe working load shall be clearly and indelibly marked on all lifting equipment; and
 - f) The Contractor shall prepare and maintain an up-to-date register containing test certificates of all lifting and hoisting equipment used on the Site. The register shall be available on Site from the commencement of construction for inspection by the Engineer and other relevant authorities.
- 3) Contractor's Access Equipment
 - a) Work shall not be carried out from a ladder, if the type of work cannot be carried out safely. Ladders shall only be used for the purpose for which they are designed;
 - b) The Contractor shall ensure that all scaffolds erected on the Site shall be erected in accordance with the relevant national regulations. The Contractor shall arrange for full information and details concerning the permitted use and loadings of scaffolds to be clearly displayed on the scaffolds. The Contractor shall not permit any person other than a qualified operative to alter, erect, dismantle or otherwise interfere with any scaffold on the Site. Any scaffold being altered or dismantled or otherwise not suitable for use shall have a warning notice that it must not be used;
 - c) The Contractor shall ensure that only experienced persons are permitted to carry out work on staging erected in roof areas and that all necessary safety harnesses and anchorage points are provided and used; and
 - d) No scaffold, ladder, trestle, or staging shall be used unless:
 - i) It has been inspected during the preceding seven (7) days and properly tagged as inspected and is safe for use;
 - ii) It has been inspected after rough set-up, which may have affected stability and

safety; and

- iii) The details of each inspection have been recorded. Records are not required for scaffolds under 2 meters in height or for ladder or trestle scaffolds. All inspections shall be made by a competent person.

4) Temporary Lighting and Power Supplies

- a) If so, required under the Project, the Contractor shall provide and maintain adequate lighting and power supplies for all parts of the Site;
- b) All electrical installations shall comply with the current regulations for electrical installations;

The Contractor shall give the Engineer a copy of all certificates prepared upon completion of electrical installations and prepared for the periodic checks as required in accordance with the current regulations. Periodic check certificates shall also be supplied whenever substantial alteration is made to an installation. The Contractor shall appoint a certified person to be solely responsible for ensuring the safety of all temporary electric equipment on the Site.

- c) All temporary electrical, installations which are associated with work on the Employer’s property shall be in conformance with the relevant local standards and be made available for an Engineer’s inspection when requested.

4.5.4 Site Hazards

1) Cleanliness of the Site

- a) The Site shall be maintained in a clean, tidy and safe condition. The Contractor shall ensure that flammable materials, e.g. paper, cardboard, oily rags, etc. do not accumulate. Spillage of hazardous liquids shall be mopped up immediately or absorbed in sand or other suitable material, which shall be disposed of by the Contractor in a manner appropriate to the spillage;
- b) The Contractor shall immediately remove and dispose any kind of refuse, inappropriate, loose, redundant materials or sludge that have been dumped either voluntarily or involuntarily. Household waste shall immediately be disposed of to a covered litter box or plastic bags to be collected by the Local Authority. Burning of waste or other materials is strictly prohibited;
- c) All access shall be kept clean of obstructions at all times;
- d) Air hoses for pneumatic tools and gas hoses for welding equipment shall be kept clear of footways. Electric cables shall be routed to avoid tripping hazards and the possibility of damage by vehicles. Where cables or hoses need to cross routes, they shall be suitably boarded over; and
- e) Pipe lengths or timber shall not be left lying about, especially pieces of wood with projecting nails or metal with sharp or jagged edges.

2) Control Against Insects and Rodents

- a) The Contractor shall ensure that the conditions shall not be favorable for the development of insects and rodents in the worksite area. The aforementioned is valid for any areas or installations occupied by the Contractor outside the worksite boundaries, throughout their occupation; and
- b) Whenever, the presence of insects or rodents is observed, the Contractor shall carry out disinfection/rodent eradication according to the Engineer’s review.

3) Protection Against Fire

- a) The Contractor shall take strict precautions to protect the Site, the Employer’s

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- property and all personnel on the site from damage or injury due to fire;
- b) The Contractor shall not burn any waste or other material on Site.
 - c) The Contractor shall follow safe procedures for removing tanks and pipes, which may have contained flammable liquids. In particular, the Contractor shall take adequate precautions to prevent fire or explosion caused by gas or vapor.
 - d) The Contractor shall keep all exits, signs and means of access clear of obstructions, particularly access to fire-fighting equipment and emergency stairs and doors.
 - e) The Contractor shall heat water using electric immersion heaters only and space heating shall be by electric convectors. All appliances shall be securely fixed.
 - f) The Contractor shall comply with international and national fire safety standards with respect to all materials, which are to be incorporated in the Permanent Works.
 - g) The Contractor shall comply with international and national fire safety standards with respect to all temporary works in areas of interface with the existing PNR system.

4.5.5 Health Hazards

- 1) Hazardous Materials
 - a) The Contractor shall impose necessary controls and procedures for the safe handling of hazardous substances.
 - b) Specific requirements related to the control of exposure to asbestos and lead are outlined in Sub-Clauses 4.5.5-2 and 4.5.5-3, respectively.
- 2) Asbestos
 - a) The Contractor shall not deliver any asbestos materials to the Site.
 - b) The Contractor shall submit to the Engineer for his review details of any friction materials containing asbestos, which are proposed to form part of the Works. Such materials or the equipment containing such materials shall be clearly labelled in accordance with the relevant regulations.
 - c) The Contractor shall comply with international and national regulations for the control of asbestos. The Contractor shall immediately cease work, cordon off the area and inform the Employer and the Engineer if any asbestos is discovered during the course of the Works. Qualified personnel shall carry out asbestos surveys;
 - d) Where any work shall result in exposure to asbestos, the Contractor shall submit for review by the Employer and the Engineer his proposals for carrying out the remedial measures that may be required to comply with third paragraph of Sub-Clause 4.5.5-2; and
 - e) The Contractor shall not commence any work on the MMSP Line which necessitates contact with asbestos, until the area or installation has been visited by the Employer’s specialist for asbestos control and removal measures as instructed by the Engineer have been completed.
- 3) Lead

The Contractor shall ensure that any work involving the use of lead in any form shall be planned and carried out in accordance with International and National regulations for the control of lead at work. The regulations apply to any work including any type of handling, moving, storing, processing or otherwise, that exposes any person to lead, including any work from which lead arises. This shall include:

 - a) In the form of lead dust, fume or vapor in such a way that it could be inhaled;

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- b) In any form which is liable to be ingested such as powder, dust, paint, or paste; and
 - c) In the form of lead compounds such as concentrated lead alkyl which could be absorbed through the skin.
- 4) Ionizing Radiation
- The Contractor shall implement measures to control exposure and dosage due to all sources of ionizing radiation, if any, which shall be subject to statutory controls.
- 5) Noise
- The Contractor shall impose controls and conduct any assessments as required regarding statutory noise regulations. Copies of noise assessments shall be made available for inspection by the Employer and the Engineer. Further requirements with respect to disturbance from noise are set out in Sub-Clause 9.8.
- 6) Contaminated Water
- a) The Contractor shall ensure that all personnel working in contact with drainage water are suitably safeguarded. In particular, the Contractor shall ensure that his personnel:
 - i) Are aware of the provisions related to men working in contact with sewage, etc. The Contractor at a point shall display this notice or a card or a suitable alternative as agreed by the Engineer, which is conspicuous to all personnel working in such conditions;
 - ii) Are provided with and wear all necessary protective clothing and equipment. In addition to overalls and gloves this shall include a facemask (respirator) and goggles where splashing may occur
 - iii) Are advised of the nearest washing area and are provided with waterless hand cleanser and towels where clean running water is not available in the working area;
 - iv) Only consume food in a designated rest room or cleanarea;
 - v) Cover all cuts, scratches or abrasions with waterproof plasters; and
 - vi) Enforce a no smoking policy.
 - b) The Contractor shall take special precautions to protect all of his personnel and others attending the site from Leptospiral Jaundice (Weils’ Disease). Recommended precautions are the wearing of protective clothing and the elimination of rat infestation.

4.5.6 Fire Protection

- 1) Minimizing Fire Hazards
- Fire hazards include but are not limited to the following:
- a) Electric traction supplies and contact wire systems;
 - b) Pantograph and arrestor;
 - c) Traction controller and traction motor;
 - d) Auxiliary power supply system and batteries;
 - e) Air-conditioning system;
 - f) Electrical wiring;
 - g) Brake pads;
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- h) Oil/fuel spillages;
- i) General combustible materials (wood, paper, etc.); and
- j) Welding tools, grinding tools, cutting tools, etc.

The Contractor shall minimize the potential fire risks in the work. Consideration shall be given to the Site supervisory controls necessary to ensure a low risk of fire. The Contractor shall also:

- a) Establish adequate means of fire-fighting and provide suitable extinguishers, hoses and other appliances at selected locations;
- b) Establish arrangements for calling the local fire brigade by telephone and other means such as radio;
- c) Pay particular attention to the design of all electrical and mechanical systems, avoid overloading the electrical supply system and maintain equipment in good working order;
- d) Ensure that all personnel are fully trained in the use of fire-fighting equipment and rescue procedures;
- e) Adopt a 'Permit-to-Work' system for special operations, particularly those that carry a relatively high fire risk;
- f) Promote general tidiness and cleanliness and ensure the removal of all flammable materials from working places when not required;
- g) Identify all possible sources and categories of fire and the appropriate means of firefighting; and
- h) Strictly enforce a ban on smoking except in designated smoking areas.

2) Control of Dangerous Work

The Contractor shall not carry out any flame cutting, welding, grinding, spark producing or similar hot work operation involving risk of fire without approval from the Engineer and the following shall apply:

- a) If hot working is likely to be undertaken, the Contractor shall advise the Engineer of the need for such hot work and agree with the Engineer all precautions to be implemented throughout the duration of the hot work;
- b) The use of thermic lance or any paraffin/gas blowpipe shall not be permitted;
- c) The Contractor shall limit as far as is reasonably practicable the emission of smoke or any noxious or pungent fumes and he shall protect all persons within the vicinity;
- d) The Contractor shall provide a competent and trained fire watchman for the whole duration of any hot working. The fire watchman shall be trained in the use of various types of extinguishers and other fire-fighting equipment and he shall ensure that an adequate supply of appropriate fire-fighting materials and equipment is readily available whilst burning or welding works are underway. The fire watchman shall not be engaged on other duties and shall remain on fire duty for at least one hour after the completion of welding or burning work to ensure there is no possibility of the outbreak of fire.
- e) Only qualified welders or fitters tested in accordance with this Specification shall be permitted to burn or weld. They shall not be permitted to work alone but shall be accompanied by a competent fire watchman.

4.6 SAFETY REQUIREMENTS ON OR ADJACENT TO THE MMSP LINE

4.6.1 Notification of Accidents

In the event of any incident or dangerous occurrence on or about the MMSP Line during the carrying out of the Works, the Contractor shall comply with statutory requirements for notification of accidents. A copy of the notification shall be given to the Employer, in order that the Employer may comply with statutory requirements as appropriate.

The Contractor shall maintain records of the activities of its personnel carrying out the Works. In the event of an incident affecting the operation of the MMSP Line, the Contractor shall give evidence to an investigation team if the Contractor's work is involved.

4.6.2 Safety on the MMSP Line

1) Person in Charge on Site

The Contractor shall appoint a responsible person as the Person in Charge on Site for any work carried out on the MMSP Line. The Contractor shall ensure that the Person in Charge on Site has been trained and is clearly identifiable. The Contractor shall provide, the Engineer to review the names and details qualifications, experience and the persons appointed for the training. The appointed Person in Charge on site may also act as Safety Supervisor per Sub-Clause 4.5.1- 1, for any particular shift.

2) Work in Traffic Hours on the MMSP Line

Where the Contractor is required to work in traffic hours on the MMSP Line but not closer than 2 meters from the nearest track, the following safety precautions shall be observed:

- a) The Contractor shall make all arrangements necessary for the safe and efficient protection of the trains and the public and shall provide and maintain all temporary structures, shields, fences, close boarded decks and protective screens to such sizes and of such types as may be approved by the Employer. The Contractor shall erect such protective arrangements during track occupations;
- b) The Contractor shall ensure equipment do not encroach on or cross the track.
- c) When work is being carried out at places where the Track is electrified, the Contractor shall issue to all personnel engaged on the work any instructions supplied by the Engineer/Employer regarding the danger to persons working in proximity to the overhead supply lines, cables, wires and electrical equipment and shall see that such personnel are made fully conversant with such instructions and that they are strictly obeyed. The Contractor shall display warning posters of the potential hazards in prominent positions on the Site.

3) Work on the Track

All work, and the movement of men and materials to be executed in any of the circumstances detailed below shall only be carried out during engineering hours:

- a) Any work within 2 meters horizontally and 4.2 meters vertically from the nearest running rail, with the exception of work on platforms;
- b) Any work involving the lifting or placing of objects in such a position and in such a manner that either the objects or the lifting equipment might be a danger to the MMSP at any stage during the operation;
- c) Any work requiring access to be gained along or adjacent to the track or restricted

- clearance areas; and
- d) Any other work which, in the opinion of the Employer, could endanger the MMSP.
- 4) Track Occupation during Engineering Hours
- a) Occupation of the track during engineering hours shall be arranged by the Employer and shall normally be granted after the traction current has been switched off. All staff, equipment and materials shall be cleared off the track within not less than 20 minutes, or such other period as the Engineer/Employer may decide, before the traction current is switched on again;
 - b) The Contractor shall not commence work without the Engineer’s/Employer’s Safety Officer/s being in attendance to enforce the Employer’s “Site Safe Procedure”;
 - c) The duration of the period of occupation may be interrupted by the passage of an engineering vehicle and all work shall be suspended as and when directed by the Engineer/Employer during the passage of the vehicle. Under no circumstances shall cranes or machines be allowed to work after the approach of a vehicle has been signaled or warning given of the approach of a vehicle, until such vehicle has been passed clear of the Site;
 - d) When work has ceased at the end of each shift all exposed uncompleted work shall be protected with hoarding; and
 - e) Panels of hoardings on platforms or adjacent to the track which are removed during engineering hours shall be securely replaced to the Engineer’s/Employer’s satisfaction not less than thirty minutes, or such other period as the Engineer/Employer may decide, before the start of traffic hours.
- 5) Engineer’s/Employer’s Safety Officer (s)

The Contractor shall before commencing any work on or adjacent to the Track, an adequate notice to the Engineer/Employer of his intention to work and arrange with the Employer for the attendance for the duration of the work of the Engineer’s/Employer’s Safety Officer(s).

4.6.3 Safety Training Requirements

- 1) Training Requirements

No Contractor's personnel shall work on the MMSP system and in particular on or adjacent to the track without first having attended and passed the relevant safety training courses including those outlined below.

All personnel attending the safety training courses shall first undergo a medical appraisal, which shall satisfy the standards for such appraisals. All persons shall be declared medically fit as a pre-requirement to attending the training courses and working on the MMSP Line.

The Contractor shall organize quality SHE training to engage managers, supervisors and other personnel/workers in behavioral change and improve safety performance. The Contractor shall analyze the training requirements for all the employees and initiate a training program to demonstrate that all persons employed, including subcontractors, suitably qualified, competent and fit.

A matrix and schedule of training requirements covering general, task-specific and SHE-related training and showing the training frequency and interval between refresher courses shall be maintained.

The training courses shall be provided by the Contractor. All other expenditure incurred by the Contractor as a result of his personnel attending the courses or medical appraisal shall be borne by the Contractor.

2) Fire-Fighting and Evacuation

The Contractor shall ensure that all personnel on Site are properly trained in the fire precautions to be observed in the course of the work, the use of fire-fighting equipment maintained on Site, the actions to be taken in case of fire, and the fire evacuation procedures from sub-surface sections of the MMSP Line and within station premises.

3) Training of Contractor's Personnel for the System and the Track

All Contractor's personnel who shall be or may be carrying out work or who may require access on or adjacent to the MMSP Line or the track, shall attend a course arranged by the Engineer/Employer before commencing any such work or obtaining any access. Contractor's personnel attending the course shall wear suitable clothing including boots or shoes for walking along the track and shall have in their possession a high visibility vest.

4.6.4 Use of Radios

The Contractor shall ensure that the use of personal radio sets or other similar electrical equipment (including personal stereo sets with headphones but excluding hearing aids) is forbidden in all areas of the MMSP Line.

The Contractor shall seek approval for the use of radio transceivers on the Employer’s premises. A written request shall be submitted to the Engineer/Employer at least 14 days before the proposed use of the radio equipment and the request shall include information on output power and allocated frequency.

4.6.5 (Not Used)

4.6.6 Hot Working

The Contractor shall ensure that Hot Working is carried out in accordance with the following requirements in addition to those specified in Sub-Clause 4.5.6-2).

Permits for hot working shall be applied for by the Contractor from the Engineer not less than 48 hours prior to the proposed commencement date of the operation.

The Contractor shall not undertake any hot work anywhere within the confines of the operating MMSP Line during traffic hours without the approval of the Engineer.

Where hot working is to be carried out in any part of the Works which is connected to the MMSP Line, the Engineer/Employer may also supply a fire watchman in addition to the Contractor's responsibilities as set out in Sub-Clause 4.5.6-2). If the attendance of the Engineer’s/Employer's fire watchman is considered necessary, work shall not commence until he is in attendance.

4.6.7 Safety of Equipment and Plant of MMSP

1) MMSP Line Equipment

All work shall be carried out in such a manner so as to ensure the safety of the MMSP Line, to prevent damage to MMSP’s equipment and to require the absolute minimum of alteration to such equipment.

2) Screening of Lights

All lights or lasers provided by the Contractor shall be so placed as not to cause any

confusion with or so as not to interfere with any signal lights on the MMSP Line. If directed by the Engineer, the Contractor shall forthwith remove such lights and lasers and replace them in a position approved by the Engineer. Such approval shall not preclude the Engineer from giving further directions as to such replaced lights or lasers.

4.6.8 Fire Protection Requirements

- 1) The Contractor shall ensure that, on the Employer's operating premises, they maintain the integrity of compartmentation of rooms and areas throughout the duration of the Works. The Contractor shall agree with the Engineer/Employer the means of ensuring such integrity of compartmentation and maintenance of the fire protection systems installed on the Employer's premises. The Contractor shall not obstruct access to fire-fighting equipment, nor isolate fixed fire protection or detection equipment unless approved by the Engineer.

- 2) Fire Performance of Temporary Hoardings in Enclosed Areas

The fire performance criteria and approved painting systems for temporary hoardings in enclosed areas shall be to the approval of the Engineer.

- 3) Storage and Use of Gas Cylinders, Flammable and Volatile Materials

- a) The Contractor shall not take or store anywhere on the MMSP Line any cylinders of industrial or flammable gases, including Oxygen, and containers or flammable and volatile materials without the prior written permission of the Engineer/Employer;
- b) The Contractor shall make arrangements for any storage of flammable and volatile material, including Oxygen, to be strictly controlled during the period of the Works;
- c) Gas cylinders and flammable and volatile materials shall be stored only at ground level and in locations approved by the Engineer. The storage areas shall be in a position that shall not cause an obstruction to passageways, and staff accommodation and not be near any source of ignition. Gas cylinders shall be stored in locked cages and be vertical and properly supported. Hoses and cylinder keys shall be removed from cylinders and kept away from the cylinders. Flammable and volatile materials shall be stored in locations separate from gas cylinders and in sealed metal containers with a maximum storage of all materials in one place of 0.025 m³.

- 4) No Smoking Policy

The Contractor shall throughout the progress of the Works, strictly enforce the Employer's ban on smoking in the Project Site, except in the designated smoking areas on the MMSP System.

4.6.9 Hazardous Materials

In addition to the requirements of Sub-Clauses 4.5.5, the Contractor shall comply with the Employer's engineering instructions with respect to the use, storage, licensing and inspection of storage facilities for hazardous materials. All hazardous materials shall be accompanied with a Material Safety Data Sheet (MSDS).

4.6.10 Delivery and Handling of Materials and Equipment

The delivery of materials, equipment by the Contractor through public areas of the MMSP Line shall be undertaken only during engineering hours.

The Contractor shall not place any material or equipment within 2 meters from the nearest running rail unless approved by the Engineer/Employer.

The Contractor shall submit to the Engineer, for review, proposals for any lifting of heavy items, storing or transporting of materials and equipment on or along MMSP premises. The Contractor's proposals shall include information on floor loads. The Contractor shall provide at least two weeks notice of his intention to carry out such work.

4.6.11 Barriers/Board-ups Protection

The purpose of the procedure is to ensure the health and safety of all personnel involved with, and working around the working perimeter including the general public throughout the Project period.

Safety measures relating to adequate protection of pedestrian crossings or walkways, covering, protection and securing of cables and hoses, warning signs for display at conspicuous places wherever necessary, adequate lighting at board-ups and barriers and availability of security personnel during work operation and to provide pedestrian and traffic control at the work Site shall be included in the Procedure.

Board-ups must be substantially and properly constructed all around the Site perimeter. Periodical checking of Site board-ups is essential and they shall be constructed according to the design requirements.

Barriers must be provided and complying with Philippine Department Order 13 and 16 and OSHS, if necessary.

4.6.12 Confined Space Entry

Personnel are at times required to enter confined spaces to clean, inspect, repair, and perform other duties associated with the equipment or the process. Confined spaces that are potentially hazardous include but are not limited to a space that:

- 1) Is large enough and so configured that an employee can bodily enter and perform assigned work;
- 2) Has limited or restricted means for entry or exit (for example: tanks, vessels, silos, storage bins, hoppers, vaults, and pits, or spaces that may have limited means of entry);
- 3) Is not designed for continuous employee occupancy; and
- 4) Has inadequate flow of natural ventilation.

Potential hazards (specifically toxic vapors), in unhealthy or fatal concentrations may result from residue of the last material in the confined space hence, the need for addressing this safety concern.

In any confined-space activity a confined-space entry permit is necessary.

The Contractor shall recognize applicable policies and procedures necessity for different standards/policies for different confined space entry applications. However, Occupational Safety and Health Standards, and Philippines’ Department Order 13 and 16, Philippines, shall still be adhered.

4.6.13 Lock Out And Tag Out

The Contractor shall establish minimum procedures to ensure the safety and health of personnel who may work on any type of equipment capable of being energized or storing energy.

Specific energy control procedures must be developed in writing for each operation covered under the purpose and scope of the Lock Out and Tag Out procedure.

General requirements in performing any undertaking for this safety procedure shall be delineated in detail and pertinent methodology shall be defined, including directives set forth in the work instructions.

Procedures and programs to be formulated for the Safety Procedure shall be in conformity with the

Department of Labor and Employment (DOLE), Occupational Health & Safety Standards, the Philippine Electrical Code and Department Order 13 and 16 of the Philippines.

4.6.14 Energized Electrical Works

The Contractor shall adopt a procedure that applies in all situations where exposure to energized or potentially energized electrical equipment is possible due to the nature of the work to be performed. Adhering to these procedures shall help to ensure that electrical work is conducted under the safest possible conditions.

The procedure shall comprehensively define the work practices for these safety matters.

All works must be performed in accordance with the provisions set forth in the written procedures and in compliance with all other applicable safety requirements.

Contractor’s employees who perform, or who have potential to perform work on energized, or potentially energized electrical equipment, wiring, distribution systems, circuits, etc. shall be qualified electricians, designated and authorized by the Site Manager once the qualification and training requirements of local legal authorities are met.

The procedure shall meet the Philippines’ Department of Labor and Employment (DOLE), Occupational Health & Safety Standards and the Philippine Electrical Code requirements.

4.7 OCCUPATIONAL HEALTH AND WELFARE

4.7.1 Physical Fitness for Workers

The Contractor shall ensure that his employees/workers subject themselves to such medical examinations as required under the law or under the contract provisions and keep a record of the same.

The Contractor shall not permit any employee/workmen to enter the work area under the influence of alcohol or any drugs.

4.7.2 Medical Facilities

4.7.2.1 Medical Examination

The Contractor shall arrange a medical examination of all his employees including his sub-contractors employees employed as drivers, operators of lifting appliances and transport equipment before employing them, after illness or injury, or if it appears that the illness or injury might have affected their fitness. The Contractor shall maintain the confidential records of medical examination or the physician authorized by the Employer.

No building or other construction shall be charged for the medical examination and the cost of such examination shall be borne by the Contractor employing the said worker.

The medical examination shall include:

- 1) Full medical and occupational history.
- 2) Clinical examination with particular reference to:
 - a) General Physique;
 - b) Vision: Total visual performance using standard orthorator like the Titmus Vision Tester shall be estimated and suitability for placement ascertained in accordance with the prescribed job standards;
 - c) Hearing: persons with normal hearing must be able to hear a forced whisper at twenty-four feet. Persons using hearing aids must be able to hear a warning shout under noisy working conditions;
 - d) Breathing: Peak flow rate using standard peak flow meter and the average peak flow rate determined out of these readings of the test performed. The results recorded at pre-placement medical examination could be used as a standard for the same individual at the same altitude for reference during subsequent examination;
 - e) Spine: adequately flexible for the job concerned;
 - f) Lower Limbs: Adequate leg and foot mobility; and
 - g) General: mental alertness and stability with good eye, hand and foot coordination.
- 3) Any other tests which the examining doctor considers appropriate.

4.7.2.2 First-aid Boxes

The Contractor shall ensure at all construction sites a first-aid box is provided and maintained for providing first-aid to the workers.

4.7.2.3 HIV/AIDS Prevention and Control

The Contractor shall adopt the Employer’s Policy on “HIV/AIDS Prevention and Control for Workers Engaged by Contractors”.

The Employer shall engage a professional agency for implementing the guidelines laid down in the policy and communicate these guidelines to the Contractor.

The Contractor shall extend necessary support to the appointed agency by deputizing the workers to attend the awareness creation programs.

The Contractor shall also extend necessary organizational support to the appointed agency for the effective implementation of the Employers’ workplace policy on HIV/AIDS for workers of the Contractors.

4.7.2.4 Prevention of Mosquito Breeding

Measures shall be taken to prevent mosquito breeding at Site. The measures to be taken shall include:

- 1) Empty cans, oil drums, packing and other receptacles which may retain water shall be deposited at a central collection point and shall be removed from the Site regularly;
- 2) There shall not be accumulation of still water at any Site, in case of still water, it shall be covered by earth and leveled;
- 3) Contractor’s equipment and other items on the Site which may retain water shall be stored, covered or treated in such a manner that water could not be retained; and
- 4) Water storage tanks shall be provided.

4.8 NOISE

The Contractor shall consider noise as an environmental constraint in their design, planning and execution of the Works and provide demonstrable evidence of the same at the Employer’s request.

The Contractor shall, at his own expense, take all appropriate measures to ensure that work carried out by the Contractor and by his sub-contractors, whether on or off the Site, shall not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

- 1) The Contractor shall ensure that all powered mechanical equipment used in the Works shall be effectively sound-reduced using the most modern techniques available including but not limited to silencers and mufflers; and
- 2) The Contractor shall construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

The Contractor shall ensure that noise generated by work carried out by the Contractor and his sub-contractors during daytime and night time shall not exceed the maximum permissible noise limits.

4.9 WELFARE MEASURE FOR WORKERS

4.9.1 Latrine and Urinal Accommodation

The Contractor shall provide sufficient latrine seat and urinal accommodation at Site. When women are employed, separate latrine accommodation shall be provided.

4.9.2 Drinking Water

The Contractor shall make in every worksite, effective arrangements to provide sufficient supply of

portable water with minimum quantity of 5 liters per worker per day.

Quality of the drinking water shall conform to the requirements of national standards on public health.

While locating these drinking water facilities due care shall be taken so that these are easily accessible from the place of work for all workers at all location of work Sites.

5 SAFETY CONSIDERATIONS FOR DESIGN

5.1 GENERAL

The safety of passengers and staff is of great concern, therefore considerable attention has been paid in setting out the parameters for design to matters that can have an effect on safety and availability. This includes not only the performance of the trains, but also such matters as maintenance of tolerable environmental conditions and standby operation under emergency conditions.

Hence, the Contractor shall bear in mind the safety requirements and ensure that the design and performance of MMSP Rolling Stock and equipment maintain high safety.

The Contractor shall pay due attention to the need to safeguard the staff who shall be required to operate and maintain the MMSP Line. For guidance, but without limiting the Contractor's responsibilities as to safety requirements, the principal aspects to be considered and incorporated into the Works shall include:

- 1) The provision of metallic guards to all moving parts such as gears, belt drives, chain drives, interlocking mechanisms and similar items;
- 2) Notices for hazards and high voltages;
- 3) Provision for lubricating, greasing, adjusting and other maintenance facilities that can be reached without hazard; and
- 4) Identification of all equipment, wires, connectors, etc.

5.2 MATERIALS

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire damage caused in the event of fire. Wherever practicable, materials shall be used which do not support combustion and which do not give off smoke, corrosive or toxic fumes, when heated.

Materials shall be selected which provide the minimum practicable hazard, and care shall be taken to minimize the risk of the effects of any fire extending beyond the place of its initiation.

6 TECHNICAL REQUIREMENTS COMMON TO ALL EQUIPMENT

6.1 STANDARDS

Where no particular national or international standard is specifically stated in the documents, the Works shall comply with the relevant standard, code, or recommendation of the following organizations:

- 1) Philippines National Standards (PNS);
- 2) Japanese Industrial Standards (JIS);
- 3) The International Organization for Standardization (ISO);
- 4) The International Electro Technical Commission (IEC);
- 5) European Norm (EN);
- 6) Rolling Stock Industrial Standard (JRIS) – Japan; and
- 7) Ministry of Land Infrastructure, Transport and Tourism (MLIT) - Japan.

The standards of the above organizations referred to herein represent the minimum requirements that shall be met. The Contractor may adopt standards of the countries of source, but he shall confirm that such standards are equivalent to or better than those either referred to in the documents or listed above. The Contractor shall submit three copies of such standards in English for the Engineer’s review, drawing attention to all differences. In the case that the Engineer does not approve such standards, the Contractor shall adopt those specified above.

It shall be understood where reference is made within these documents to certain standard specifications, the reference shall be construed to mean the standards, with all subsequent amendments, changes or additions as thereafter adopted and published that are in effect at the date of invitation to tender.

It shall be the responsibility of the Contractor to ascertain that all relevant local laws, rules, standards, codes and regulations are strictly adhered to. Unless otherwise reviewed by the Engineer, any reference in any standard to a recommendation shall be interpreted by the Contractor as a requirement of the Employer. Also, unless otherwise reviewed by the Engineer, whenever any such standard provides for alternatives, the most stringent alternative shall apply.

The Contractor shall provide one (1) copy of all relevant manufacturing and testing standards for items under his scope of supply.

In addition to the above, all standards and codes referred to in Bid Documents to be supplied shall be new, complete and the latest version/issue. The submission shall be within 35 days from Commencement Date of the Works in accordance with the Quality Management Plan (QMP).

6.2 UNITS

The International System of Units (SI Units) shall be used for measurement and design criteria for equipment, drawings and materials supplied and installed under this contract, unless approved otherwise in writing by the Engineer.

6.3 SUITABILITY OF PURPOSE

The Rolling Stock shall be designed, and constructed to meet their particular use by the Employer. The design shall facilitate inspection, cleaning, lubrication, repairs and operation in which continuity of service is a major consideration.

All materials used shall be of the best quality and of the class most suitable for operating under the conditions specified and shall withstand the variations of environmental conditions without distortion, deterioration or undue stresses in any part, and also without affecting the strength and suitability of the

various parts for the work for which it must perform. No welding, filling or plugging of defective parts shall be permitted without the approval in writing of the Engineer.

The design shall incorporate every necessary feature to ensure the safety of all those concerned in operation and maintenance.

As far as possible, the systems and equipment offered by the Contractor shall be the standard manufactured model with an appropriate documented history of reliable service and performance.

All items of systems and equipment shall be new and shall not have been in service at any time prior to delivery, except as required for testing purposes.

Corresponding parts liable to renewal shall be interchangeable. When required by the Engineer, the Contractor shall demonstrate this feature.

All apparatus shall operate without undue vibration and with the least practicable amount of noise in accordance with the requirements of the Technical Requirements. The system shall meet the overall noise limitations of the applicable Philippine Code. Equipment boxes, cubicles and similar enclosed compartments shall be adequately labelled, ventilated to restrict condensation and, where necessary, suitable integral anti-condensation heaters shall be provided.

Carbody structure and equipment to be installed on the exterior shall be so designed from stainless steel or Aluminium alloy and equipped with adequate drain holes so as to avoid pockets in which water can collect.

Accessible means shall be provided for the easy lubrication where required of all bearings, mechanisms and moving parts. Grease lubricators shall be fitted with standard nipples.

All electrical connections and contacts shall be of ample cross section and surface for carrying continuously the maximum design current without undue heating, and shall be secured by clamps, bolts or set screws of ample size, and fitted with locking devices of approved type and material.

Surfaces subject to rubbing or wearing shall be machine finished. Joints employing a gasket material shall be so constructed that the packing is maintained under sufficient compression in all parts, so that an efficient joint can be made without the use of jointing compound. Gasket material shall be of the minimum thickness necessary and of approved composition.

All apparatus shall be designed to obviate the risk of accidental short circuit due to animals, birds and vermin. Openings in ventilation enclosures shall be so constructed to prevent entry of vermin and insects.

All apparatus incorporating hinged doors shall be provided so that the doors can be opened to at least 90 degrees or can be readily removable after adjacent equipment has been installed.

6.4 MANUFACTURER’S STANDARDS

Unless specified otherwise, all materials and equipment associated with the installation shall be handled and installed strictly in accordance with the manufacturer’s recommendations and by workers who have undergone training by the manufacturer and have previous experience with the equipment and materials.

The Contractor shall ensure that his co-workers and subcontractors use appropriate tooling recommended by the manufacturers for the installation of their materials and equipment.

6.5 RIGHT OF REJECTION

The Employer and the Engineer shall have the right to reject all material or work that is non-compliant, and require the replacement and rectification of the Works at the sole expense of the Contractor.

6.6 EMC

The CP107 contractor shall design and supply the rolling stock considering the EMC/EMI and involved in the integration EMC testing for MMSP and the inter-operation with NSRP-S section.

The CP107 Contractor shall either produce an EMC Management plan in consultation with all interfacing parties including the E&M Systems and MEP suppliers or be required to follow the EMC Plan provided by the GC or other party acting as the System Integrator.

Electro-Magnetic Interference/Radio Frequency Interference (EMI/RFI) shall be held to a minimum commensurate with good design practices, and in no case shall signal levels be permitted which interfere with, or compromise, the operation of any of the Employer’s systems.

Test data shall be submitted indicating compliance with the latest industry guidelines. The Contractor shall demonstrate by test that electromagnetic interference levels do not exceed the current pertinent recommendations of the International Electro- technical Commission. In addition, the Contractor shall demonstrate by test that his equipment does not interfere with any of the Employer’s existing systems. Should testing prove that the Contractor’s equipment interferes with any of the Employer’s systems, as judged by the system supplier, the Contractor shall ensure modifications are carried out to the equipment to bring it into compliance with this requirement.

The Contractor is required to submit for review and approval the EMI/RFI study report which shall be prepared in accordance with IEC 62236 or equivalent.

7 QUALITY ASSURANCE

7.1 QUALITY MANAGEMENT PLAN (QMP)

Within thirty-five (35) days from Commencement Date of the Works, the Contractor shall submit a detailed Quality Management Plan (QMP) to the Engineer for his review and comments.

The Quality 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) Project details including name, Contract Number;
- 2) A summary of the Project requirements including all proposed quality activities;
- 3) All Quality Assurance system details including proposed reporting and quality control procedures, proposed by the Contractor for his use in the execution of the Works;
- 4) A list of all the Codes of Practice, Standards and Specifications that the Contractor proposes to apply to his work. These shall include those that differ from or complement the requirements of the Contract or those specified in the Contract;
- 5) The Contractor’s proposals for internal, subcontractor and contractor-under-subcontractor quality assurance audits, including a schedule;
- 6) A statement detailing the records that the Contractor proposes to keep, the time during which they shall be prepared and the subsequent period and manner in which they shall be indexed, prepared and stored;
- 7) Inspection and test plans for every activity requiring inspection and testing. The plans shall identify the level of inspection and testing required and shall stipulate who is responsible for releasing an activity from a "HoldPoint";
- 8) 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 Project Works into elements for effective technical and managerial control, the reporting structure and the relationship between all parties involved;
- 9) The appointment of a Quality Assurance Manager;
- 10) The specific allocations of responsibility and authority given to managerial and technical staff with particular reference to the design and site supervision of the Project Works;
- 11) 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;
- 12) The Contract specific quality procedures, works instruction and/or standard forms, if applicable; and
- 13) A full list of quality procedures, works instructions, and/or standard forms, including any Contract-specific documents to be applied to the Project shall be defined. The specific ways to perform the related activities and the records to be generated shall be defined as objective evidence of the activities performed results achieved shall be demonstrated and shall cover all the requirements of the Project including, but not limited to, the following activities:
 - a) The review, approval and updating of the quality system documents to ensure their continuing suitability and effectiveness;
 - b) Design control for 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;
- c) Drawing management in main office and Site office(s), including production, approval, updating, maintaining, storage and distribution;
- d) Project document management, including registration, updating, indexing, filing, maintenance, storage and distribution;
- e) Monitoring and control of subcontractors with respect to programme, submission and quality of Works;
- f) Monitoring of the submission and re-submission to the Engineer;
- g) Monitoring of the ordering and delivery of materials, plant and equipment;
- h) Quality control of the Project Works;
- i) Quality audits on the Contractor and subcontractors of any tiers; and
- j) Establishing and maintaining a record in accordance with the Contract requirement provision.

The Quality Management Plan comprise of management quality, Planning Design Quality Plan Manufacturing Quality Plan (including inspection and testing) and Testing and Commission (including integrated testing and commissioning Quality Planning).

The QMP shall be updated as necessary from time to time to incorporate for continuous improvement, aspects, subject to Engineer review and possible change to the Contractor’s control procedures.

7.1.1 Design Quality Plan

The Contractor shall prepare a Design Quality Plan for all 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.

7.1.2 Manufacturing Quality Plan

The 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 for 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 the subcontractor responsible for the day-to-day

- management of the manufacture of the item;
- 3) The specific allocations of responsibility and authority 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:
 - a) The particulars of the material to be incorporated into the items;
 - b) The manufacturing process in compliance with drawings and specifications;
 - c) The identification or referencing requirements for traceability of the manufactured items;
 - d) The identification of the inspection and test status of the materials and final manufactured items;
 - e) The disposition of nonconforming materials and manufactured items.
 - f) The handling, storage, packaging, preservation and delivery of the manufactured items.

7.1.3 Inspection and Test 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 Project with submission and review status, and this shall be submitted to the Engineer on 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 test;
- 4) The personnel responsible for certifying the inspection and test;
- 5) The inspection and test method or a reference to the relevant standard of inspection and/or test;
- 6) The frequency of the inspection or test;
- 7) The compliance criteria of the inspection 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.

7.2 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.

7.3 QUALITY AUDITS

The Contractor shall carry out Quality Audits on the Project 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 to 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 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.

7.4 NOTIFICATION OF NON-CONFORMITIES

If, prior to issue 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.

7.5 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 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-conformities identified by the Engineer or the Contractor within the reporting period and those non-conformities not yet satisfactorily closed; and
- 4) A narrative appraisal of the performance of the quality system, including any non-conformities, shortcomings or problem areas identified and the corrective and preventive

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.
- 4) Summarizes any actions proposed by the Contractor to overcome any nonconformity.

7.6 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 shall be delivered to the Engineer in DVD form upon completion of the Contract Works.

7.7 INFORMATION MANAGEMENT

The Contractor shall submit an Information Management Plan as part of the Quality Management Plan describing how the Contractor shall create, collect, store, search, manage and distribute information.

The Information Management Plan shall:

- 1) Include system architecture and process to describe how the Contractor shall provide information to the Engineer in a controlled, efficient, transparent, auditable and timely manner;
 - 2) Contain information on workflow, metadata, Contractor’s approval process and status;
 - 3) Be compatible with the Contractor’s other software used on the Contract;
 - 4) Reference the Contractor’s Electronic Document Management System (EDMS) document management plan;
 - 5) Detail how data and information shall flow between the Contractor’s CAD engineering environment to the Contractor’s document control EDMS environment;
 - 6) Detail how assigned authority is controlled through workflows and permissions to ensure any sign-off function shall only be presented to the correct authority.
 - 7) Detail how object data from the CAD Model shall populate areas in the Configuration Model.
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7.8 ELECTRONIC DOCUMENT MANAGEMENT SYSTEM (EDMS)

The Contractor shall use an Electronic Document Management System (EDMS), which is compatible with the Employer’s EDMS, to coordinate and control the document flow (creation, processing, storage, retrieval and distribution) of electronic and paper documents in a secure and efficient manner.

All the Contractor’s documents shall be controlled via the EDMS system for the work under the Contract. The Contractor’s EDMS shall remain in effect during the Contract and Defects Notification Period.

These requirements cover all types of documents including, but not limited to:

- 1) management plans, procedures, method statements;
- 2) quality documentation, norms, standards;
- 3) design documents;
- 4) design models;
- 5) as-built drawings;
- 6) operation and maintenance manuals;
- 7) engineering calculations;
- 8) reports - progress, construction, test & commissioning, technical and non- technical;
- 9) time, schedules and cost.
- 10) Certification.

The Contractor’s EDMS shall:

- 1) provide a storage and backup infrastructure to prevent data loss and provide data recovery mechanisms;
- 2) Provide a single, controlled source for each document;
- 3) Provide an efficient search and retrieval of specific documents;
- 4) Provide measures to control restricted access to program documents and provide access to all documents to all team members;
- 5) Identify document development and approval processes that promote quality and consistency.
- 6) Provide clarity regarding which version of a deliverable is the latest version;
- 7) Provide a clear record of deliverables.
- 8) Enable quick and direct propagation of changes.
- 9) Provide an accurate and complete archive of documents to the Employer.

7.9 ELECTRONIC DOCUMENT MANAGEMENT

The Contractor shall submit an Electronic Document Management procedure as part of the Quality Management Plan for review by the Engineer, detailing how the Contractor shall implement and maintain a web-based EDMS.

The EDMS shall give an overview of the strategy and shall include a permissions matrix mapped to roles and responsibilities, workflow, systems architecture, resilience and disaster recovery.

7.10 SOFTWARE MANAGEMENT AND CONTROL

7.10.1 Prescriptive Framework

- 1) All software to be developed or modified shall follow the normative requirements of standards proposed by the Contractor. The Contractor shall define the Software Quality Assurance Management section within the Quality Management Plan what techniques and measures are to be applied for software development;
- 2) The section shall require the Contractor to provide all changes, bug fixes, updates, modifications, amendments and new versions of the programs, as required by the Engineer;
- 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;
- 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 Software Engineering Change Proposal (SECP), which shall be reviewed by the Engineer; and
- 5) It will be incumbent upon the Contractor to take responsibility for any changes required to the software.

7.10.2 Software Framework

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 meet the requirements as stipulated in the ERG and ERT. ISO 9000-3 is considered appropriate for any software framework.

7.10.3 Software Management Control

The Contractor shall assign the Software Manager and Software Quality Manager for software development, if software development or modifications are required under the Contract.

7.10.4 Auditing

The Engineer may carry out an audit of the software. Further external independent audits may also be arranged at the Engineer discretion.

7.10.5 Software Acceptance

- 1) The Contractor shall also submit an Operational Safety Report (Software) for software acceptance by the Engineer.
- 2) The Operational Safety Report (Software) shall include, as a minimum
 - a) 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;
 - b) Evidence of Quality Management
Shall provide evidence to demonstrate that the software development has been

- subject to acceptable quality assurance;
- c) Evidence of Safety Management
Shall provide evidence to demonstrate that the software development has been subject to acceptable safety management;
- d) Technical Report
Shall describe how software integrity has been achieved;
- e) Operation and Maintenance Report
Shall describe the software operation and maintenance characteristics.
- f) Restrictions for Use
Shall define what restrictions are applied to the use of the software.

7.10.6 Availability of Application Software and Development Tools

- 1) With the exception of commercial, off-the-shelf software, the Engineer shall be provided with access to full software documentation listings and development tool details for the application and maintenance of that software. For such commercial software, the Contractor shall provide all available documentation for the application and maintenance of that software;
- 2) Complete documentation along with the software to be supplied by the Contractor, as above, shall comprise of signal flow diagram, detail of signals, interpretations so as to enable 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 system efficiently.
- 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.

7.10.7 Re-Use of Existing Software

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 detailed review, where the proposed application is of the same or lower safety than the current application.

7.10.8 Test Software

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.

7.10.9 Software Rights

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 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.

7.10.10 Security

- 1) The Contractor shall define the procedures to maintain the security of the software.

Aspects to be considered include:

- a) Sabotage

The Contractor shall describe what measures are to be taken to protect the software against sabotage during the development phase. This description shall define the physical restrictions as well as procedural measures and specific tests to be carried out on the software.

- b) Unauthorized Access

The Contractor shall describe what measures are to be taken to protect the software against unauthorized access and subsequent modification. The description shall define both physical and procedural methods.

- c) Virus

The Contractor shall ensure software, which is susceptible to viruses, is developed in environment certified free from computer viruses. To achieve this, the Contractor shall use propriety virus detection software and suppression tools.

- 2) All software delivered to site shall be accompanied by evidence that demonstrates the media is free of viruses.

7.10.11 Security Obligations

- 1) Within 14 days of the installation of any safety critical software which may impact the train operation, into the Works, the Contractor shall deposit the software in the escrow account, which shall include, without limitation:

- a) All design documentation relating to the software; and
- b) Any specified development tools required for maintenance of the software, including, but not limited to, editors, compilers and linkers.

- 2) The access to the above-mentioned escrow account shall be given to the Employer for him to translate or modify the software in case of:

- a) The owner of the software becomes insolvent or has a receiving order made against them or makes an arrangement or assignment or composition with or in favour of its creditors (including the appointment of a committee of inspection) or goes into liquidation or commences to be wound up or has a receiver, liquidator, trustee or similar officer appointed over all or any part of its undertaking or assets or if distress, execution or attachment is levied on, or if another party takes possession of, any of its assets or any proceeding or step is taken which has an effect comparable to the foregoing in any relevant jurisdiction; or
- b) The owner of the software ceases to trade; or
- c) The owner of the software assigns copyright in the software and the Contractor fails within 60 days of such assignment to procure in favour of the Employer, a licence from the new owner in the same terms as that required by the Contract; or

- d) The Contractor is in breach of any of his obligations under the Contract.
- 3) The cost of opening and maintaining the escrow account until end of the DNP shall be borne by the Contractor.

7.10.12 Software Documentation

The documentation of software shall be supplied to the Engineer/Employer before the completion of the DNP.

7.11 QUALITY ORGANIZATION

The Contractor shall submit a detailed organization chart. It shall identify the responsibilities, authority and interrelation of all personnel who manage, perform and verify items affecting quality system and the Works. The organization chart shall be specific only to this Contract.

The chart shall identify the quality management representative who shall act as the quality coordinator(s) for the Contractor in all dealings with the Engineer.

7.12 IDENTIFICATION AND TRACEABILITY

The Contractor shall produce and maintain procedures for identifying the product from applicable drawings, specifications and other documents during all stages of production, delivery and installation. Traceability of materials and equipment shall be documented in accordance with the Contract and the QMP.

Notwithstanding the requirements of the contractor's quality system, the Contractor shall retain all inspection certificates, test certificates and certificates of conformity, which shall be collated to allow easy traceability and made available for inspection by the Engineer at the Contractor's premises.

7.13 QUALITY AUDIT

The Contractor shall make available on request any documents which relate to their recent internal audits.

Periodically during the life of the Contract, the Engineer shall conduct compliance audits of the quality system. During any audits by the Engineer, the Contractor shall provide qualified staff to accompany the auditor.

8 SYSTEM ASSURANCE

8.1 GENERAL

System Assurance Management is applicable for all stages of the Rolling Stock development, including design, manufacture, testing, commissioning, systems integration, trial operations, and in-service operations.

The Contractor shall submit a comprehensive System Assurance Management Plan (SAMP) which contains all requirements within this ERG Section 8 of this document, for the Engineer’s review.

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. The SAMP shall address the Performance and Safety of the Rolling Stock.

A Taking Over Certificate (TOC) will be issued for each train set. In order to obtain a TOC for the Rolling Stock from the Engineer, it is required that each train set achieves 1,500 km of Fault-Free Running (FFR) during system integration and trial operations.

A Performance Certificate will be issued by the Engineer for the total performance of the fleet. 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 train set shall achieve 10,000 km or 2 months of FFR, the fleet (30 train sets) shall achieve a Mean Distance Between Failures (MDBF) of 50,000 km causing a delay greater than 5 minutes, a fleet in-service Operational Mean Time To Restore (OMTTR) of 15 minutes, and the fleet maintainability of capital components a Corrective Mean Time To Repair (CMTTR) of 4 hours.

The Contractor shall provide sufficient documented information for review by the Engineer. It is expected that the design demonstration of the Rolling Stock performance shall be achieved through supplier-based material self-certification, including cross-references to proven and accredited in-service performance of Rolling Stock equipment supplied in a similar railway application.

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 Rolling Stock equipment, with a product-generic safety case application to be made based on existing safety certification.

8.2 PERFORMANCE ASSURANCE PLAN (PAP)

Within the SAMP, the Contractor shall provide a Performance Assurance Plan (PAP) for the Engineer’s review. The PAP shall describe the activities that the Contractor proposes to carry out during the life cycle of the design, implementation and operation of the Rolling Stock, and shall demonstrate compliance with the Employer’s Requirements, achievement of a TOC for each train set, and a Performance Certificate for the total fleet (30 train sets).

8.2.1 Performance Acceptance Criteria (PAC)

Each train set shall achieve:

Trial operations – 1,500 km FFR.

In-service Operations - 10,000 km or two (2) months of continuous in-service operational FFR.

The train fleet (30 train sets) as a whole shall achieve:

MDBF – In service operational faults, MDBF no less than 50,000 km causing a delay greater than 5 minutes.

OMTTR – Operational Mean Time To Restore (OMTTR) capital components; the train sets shall be restored to operational order in an OMTTR of 15 minutes.

CMTTR – Corrective Mean Time To Repair (CMTTR) capital components shall not be greater than 4 hours.

8.3 PERFORMANCE REPORTS

The Contractor shall provide Performance Reports to support the applications for Rolling Stock TOC for each train set and the Performance Certificate for the fleet (30 train sets).

The Rolling Stock TOC Performance report shall be issued for each train set prior to operational acceptance and shall provide:

- Technical design justification of performance;
- Cross reference to Rolling Stock performance in a similar application;
- The design prediction for MDBF, OMTTR and CMTTR of all capital components; and
- Individual train set FFR trail operations performance.

The Rolling Stock Performance report shall be issued progressively on a monthly basis, shall be finalized at the end of DNP, and shall provide:

- In-service FFR operational performance of individual train sets;
- In-service operational performance of the fleet (30 train sets) MDBF.
- The in-service OMTTR and CMTTR of all capital components.

8.4 PERFORMANCE CERTIFICATE

During the in-service Defects Notification Period (DNP), the fleet (all 30 train sets) in total shall demonstrate successful achievement of the Performance Acceptance Criteria (PAC) which will be a prerequisite of the application for a Performance Certificate to be issued by the Engineer.

Failure to meet the PAC within the DNP shall mean that the DNP shall be extended until such time as the PAC of the total fleet has been met.

The DNP shall be up to a limit of 4 years from the date of commencement of the first train in-service operation.

8.5 SAFETY ASSURANCE

8.5.1 Safety

Safety is defined as freedom from those conditions that can cause death, injury, occupational illness, or damage or loss of equipment or property. All circumstances susceptible to cause injuries or fatalities of passengers, operation staff, and maintenance staff are considered as risks, and by extension, includes all events leading to a partial or total destruction of costly equipment. The objective of safety is expressed by the capability of the Rolling Stock to keep the physical integrity of the asset and to preserve the safety during railway operations and maintenance for passengers, staff and persons in general. The safety assurance program aims to reduce to a tolerable level the probability of occurrence of catastrophic or critical events causing damage to assets or harm to any person.

The Contractor shall bear the duty of safety in design for the assurance of safety for the life cycle of MMSP operations. The Rolling Stock shall fulfil the safety requirements of all General Requirements

and Technical Requirements and shall demonstrate that the train is fit for purpose to be operated and maintained in a safe manner for the MMSP project.

8.5.2 Safety Assurance Plan (SAP)

Within the SAMP, the Contractor shall provide a Safety Assurance Plan (SAP) for review by the Engineer. The SAP shall cover the design, manufacture, testing, commissioning and integrated testing phases, and safety management for in-service passenger operations. The Plan shall further identify how the magnitude and seriousness of events or malfunctions which could result in harm to passengers or staff and damage equipment or property will be minimized.

8.5.3 Safety Report

The Contractor shall carry out Safety Assurance and provide Safety Reports to the Engineer to support the Rolling Stock safety application, in coordination with the Operator, to gain a TOC from the Engineer, and a final in-service safety report to support the Performance Certificate application.

The Rolling Stock Design Safety report shall provide:

- 1) Technical Justification for Rolling Stock safety.
- 2) Cross reference to a generic Rolling Stock safety application of similar product provided.

The Rolling Stock Operational Readiness Safety report provided for each train set at their TOC shall provide:

- 1) The Safety application for in-service operations.
- 2) The Safety Management System to be applied for in-service operations.

The Rolling Stock In-service Final Operational Safety reports shall be issued progressively on a monthly basis and finalized at the end of DNP, they shall provide:

- 1) Safety performance.
- 2) Safety recommendations.

8.6 INDEPENDENT ASSESSMENT

The Employer shall appoint independent engineers and/or Independent Safety Assessors (ISAs) to assess on compliance with contract requirements on System Assurance. The Contractor, subcontractors and suppliers shall provide assistance to the appointed engineers and assessors, as required.

The independent assessor shall undertake the following:

- 1) Safety audits;
- 2) Design reviews;
- 3) Witnessing of testing activities;
- 4) Review of the safety and quality organizational activities;
- 5) Review of the safety processes;
- 6) Assessment of safety applications.
- 7) Provision of safety recommendations to the Employer.

9 CONTRACT PROCEDURES

9.1 MANAGEMENT OF THE CONTRACT

On or before the commencement of the Works, the Contractor shall prepare and submit for review by the Engineer, details supplemented by diagrams as necessary, of the organization which he proposes to adopt for the management of the Contract. The details shall cover all aspects of the Contract and the function, responsibility and authority of each person represented shall be defined.

Prior to their commencing work on the Contract, the Contractor shall submit for review by the Engineer, names, qualifications and experience of all the key personnel in their organization.

Any changes or additions either to the organization or to key personnel shall be subject to review by the Engineer.

9.2 (NOT USED)

9.3 (NOT USED)

9.4 SUBMISSION OF INFORMATION – GENERAL

The Contractor shall submit to the Engineer, designs, general arrangement and detail drawings, specifications, reports and other technical literature, method statements, calculations, schedules, programs, samples, patterns and models for review in accordance with the requirements of the Contractor's final time schedule.

The Contractor shall be responsible for the completeness of all information submitted.

The Contractor shall submit his designs for the works to the Engineer for review. The design shall be submitted in the following stages as stated in Sub-Clause 24.2 of the Technical Requirements:

- 1) Conceptual design;
- 2) Preliminary design; and
- 3) Final design.

9.5 SUBMISSION OF INFORMATION FOR REVIEW

Drawings, diagrams, specifications, calculations, technical details, reports, method statements, technical literature, schedules and all other documents submitted by the Contractor for review shall comply with the following.

- 1) The drawings, diagrams, specifications, calculations, schedules and all other documents shall be complete, duly signed and of good legibility.
 - 2) Drawings and diagrams shall be submitted on "A" series sheets. Drawings shall be titled, numbered and dated.
 - 3) All specifications, calculations, schedules and documents shall have a front cover sheet stating the title, date and document reference number;
 - 4) When schematics or diagrams are submitted, they shall be accompanied by all of the necessary supplementary information to describe the function and operation of the equipment;
 - 5) When drawings diagrams, specifications, calculations, schedules and other documents are revised and/or resubmitted for review approval, all the revisions shall be clearly defined and located on all copies, and the document reference number shall contain a revision letter or number. The letter accompanying the drawings shall list the following
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information in tabular form:

- a) The drawing number including the current revision letter or number;
 - b) The drawing title;
 - c) A brief description of the latest revision.
 - d) The reference number of the Engineer’s letter, to which the revisions correspond.
- 6) The Contractor shall issue to the Engineer six (6) prints of each drawing and a copy of the electronic files. The electronic format shall be as approved by the Engineer, but must allow the Engineer to clearly document future changes;
 - 7) The Contractor shall provide to the Engineer six prints of all networks and programs and a copy of the electronic files. The electronic format shall be as approved by the Engineer.
 - 8) If original text of any technical literature provided by the Contractor is not in the English language, the Contractor shall submit an unofficial but accurate English translation of the text.

Detailed manufacturing drawings shall not be required for review, but shall be made available for examination or shall be submitted for comment if the Engineer so requires.

Nothing in the foregoing shall preclude the Engineer from requiring the Contractor to submit any further design, drawings, specifications, calculations, schedules, samples, patterns or models in connection with the Contract or to explain any point of design, installation, operation or maintenance of the equipment.

9.6 REVIEW OF DRAWINGS, DOCUMENTS AND OTHER INFORMATION

Any action taken by the Contractor to proceed with any part of the Works before the drawings are reviewed by the Engineer shall be entirely at the Contractor’s risk, and any subsequent addition or modification to the Works requested by the Engineer shall be carried out by the Contractor at his own expense.

The Contractor shall also submit to the Engineer any further detailed drawings the Engineer may reasonably require of any components or equipment in order to assess the design and its compliance with the Contract.

The Engineer shall respond in accordance to Document Submission and Response Procedure as described in Appendix E.

The Contractor shall be responsible for preparing and keeping up to date a contract drawing list showing the numbers and titles of each drawing and the current status of approval by the Engineer. Two copies of the whole list shall be sent to the Engineer at monthly intervals. Copies of revised pages of the list shall be distributed whenever a drawing is revised and resubmitted.

Following approval of drawings, the Contractor shall issue to the Engineer six (6) prints of each approved drawing and a copy of the electronic files. The electronic format shall be as approved by the Engineer, but must allow the Engineer to clearly document future changes.

No approval by the Engineer shall absolve the Contractor from any of their duties, responsibilities or liabilities under the Contract.

9.7 EMPLOYER'S PLANT, EQUIPMENT AND PROPERTY

Plant forming part of the Works may be used by the Contractor only with the approval of the Employer and if so used, the Contractor shall be responsible for restoring it to an 'as new' condition before carrying out the completion tests.

The Contractor shall be responsible for the protection, watching, lighting and safe custody of all plant, equipment and property being used by the Contractor for the Works or left on the Site.

If and when such plant or equipment is loaned free of charge to the Contractor by the Employer, the Employer shall reserve the right to provide operators, attendance, fuel and lubricants together with routine maintenance required for the operation of the plant or equipment. If the equipment is not self-propelled, the Contractor shall be responsible for the collection and transportation of the equipment to and from the Site.

If and when the Employer’s plant or equipment is hired to the Contractor, the Contractor shall be required to enter into a formal agreement setting out the conditions of hire.

The Employer shall not accept liability for any loss or damage caused or alleged to be caused to the Contractor in the event of breakdown or non-availability of any plant, equipment, etc.

9.8 MINIMIZING NUISANCE AND DISTURBANCE

All work on Site shall be carried out in such a manner as to minimize nuisance and disturbance to others working on the Site, or to persons outside the Site, from smoke, fumes, noise, vibration, discharge of water from the Site or from any other cause.

All plant and equipment used by the Contractor on the Works shall be effectively attenuated by means of efficient silencers, mufflers, acoustic linings, shields, acoustic enclosures or screens. Plant and equipment shall be maintained in good order and operated to minimize noise emissions. Plant and equipment shall be sited, as far as practicable, away from adjacent occupied buildings.

The provisions shall not be applicable in the case of emergency work necessary for the saving of life or property, or the safety of the Works.

Truck loading, unloading and hauling operations shall be conducted so that noise is kept to a minimum.

10 PROJECT IMPLEMENTATION

10.1 PROJECT MANAGEMENT

10.1.1 Project Management Plan

The Project Management Plan, to be prepared by the Contractor, shall be submitted within 28 days following the Commencement Date, to the Engineer for review, and shall conform to the minimum requirements specified below. It shall clearly demonstrate the integration of all entities which comprise the Contractor and any Subcontractors of the Contractor into one management structure.

The Project Management Plan shall contain an overview or document tree showing in schematic form, supplemented as necessary by text, how the various other Contractor’s management plans interrelate. This schematic overview shall show the titles of the various Management Plans and the main headings of the contents.

The Project Management Plan shall reference, and where necessary be referenced in, the various other Contractor’s management plans in order to provide an integrated set of documents containing all that is necessary to manage the Project and achieve the requirements specified in, or reasonably inferred from, the Contract.

The Project Management Plan shall describe the procedures, practices, and sequence of activities necessary to fulfil the requirements. As a minimum, the Project Management Plan shall include:

- 1) Scope of the Plan;
- 2) References to all requirements relevant to the scope of the Plan;
- 3) Organizational chart(s) identifying the parties involved, their roles, main tasks and the responsibilities of key personnel.
- 4) Descriptions of what is to be done, how, by whom, with what and by when;
- 5) Definition of the interfaces within the team, including interfaces between design, construction, sub-contractors and suppliers;
- 6) Description of the interrelationships with other contractors employed for the MMSP;
- 7) Description of the interrelationships with other third party contractors that shall interface with the MMSP.
- 8) Description of what records are to be produced, when, by whom and how these records are to be controlled and maintained.

10.1.2 Communication (Internal and External)

Procedures and guidelines for communications both internal to the Contractor’s organization and externally with the Engineer, statutory authorities, utility owners, third parties, and other contractors and suppliers employed by the Employer for implementation of the MMSP shall be incorporated in the Contractor’s Project Management Plan and shall include, but not be limited to:

- 1) A distribution structure which details to whom information shall flow and what methods shall be used to distribute various types of information. This must be compatible with the responsibilities and reporting relationships outlined in the Contractor’s organizational chart.
- 2) Plans and procedures for communication between the Contractor and third party stakeholders with respect to statutory permits and approvals.

10.1.3 Contract Directory

The Contractor shall establish and maintain a contract directory containing the following information for its organization:

- 1) Full name, title and postal address;
- 2) Telephone number(s).
- 3) Corporate email address(es).

For the Contractor’s key personnel:

- 1) Full name and title;
- 2) Individual telephone number and mobile telephone number; and
- 3) Individual email address.

For the Contractor’s main sub-contractors and suppliers:

- 1) Scope of work;
- 2) Full name, title and postal address;
- 3) Telephone number(s); and
- 4) Email addresses.

For the key personnel of the main Sub Contractors and Suppliers:

- 1) Full name and title;
- 2) Individual telephone number and mobile telephone number; and
- 3) Individual email address.

The Contractor shall notify its contract directory to the Engineer within 28 days of the Commencement of the Works and shall keep the Engineer informed of any changes thereto Within 14 days thereafter, the Engineer shall notify to the Contractor the names, title and contact details of the authorized representatives of the Engineer and the other Contractors engaged on the MMSP, by submission of the Employer’s Project directory.

10.1.4 Inception Report

An Inception Report shall be submitted by the Contractor to the Engineer within 30 days following the Contract kick-off meeting convened by the Engineer, and shall identify any critical activities to be initiated within the following 90 days.

The report shall include as a minimum:

- 1) Requests for any additional information or clarifications required by the Contractor which have not been provided in any of the documents that comprise the Contract;
- 2) Identification of the preparation activities planned by the Contractor to facilitate the design process;
- 3) Identification of activities in connection with the provision of design input to the utility companies;
- 4) A provisional schedule of initial organizational meetings between the Employer and the Contractor;

- 5) Identification of any issues which may threaten the planned progress of the Works during the next 90 days
- 6) A list of contacts and/or meetings with LGUs, other statutory authorities and/or third parties for the next 90 days.
- 7) The first three-monthly rolling program.

The Contractor may issue supplements to this report if the need for additional data is recognized within 30 days following submission of the report.

10.1.5 Liaison with Others

10.1.5.1 Approvals from Government Authorities and Agencies

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

10.1.5.2 Meetings with Government Departments and Agencies

The contractor shall be responsible to arrange meetings with external interface parties. When the Contractor arranges meetings with external interfacing parties, including Government departments and utility undertakings or interface contractors, it shall inform the Engineer in advance four (4) working days (excluding 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.

10.1.5.3 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.

10.2 CONTRACT PROGRAMS

10.2.1 Programming Software and Structure of Programs

Programming software to be used to prepare the programs shall be the latest version of Primavera. The Contractor shall provide free of charge two (2) Primavera Software User Licenses (stand-alone) including maintenance for the Engineer’s use until the date of issue of the Performance Certificate.

All programs shall be developed by computerized Critical Path Method (CPM) using the Precedence Diagramming Method (PDM) and shall be presented in both bar chart and time-scaled network diagram format, suitably colored to enable easy reading. All programs shall be submitted with standard activity reports (showing times, floats etc.) and narrative statements, explaining the programs.

The narrative shall be a description of the order of procedure in which the Contractor proposes to carry out each main item of work. Personnel schedules and

equipment schedules shall be prepared showing the complement of personnel and equipment proposed for the execution of the Works.

All works programs shall include a time chainage diagram showing a graphical representation of the major works including teams/gangs with chainage on the horizontal and time on the vertical.

The critical path shall be clearly marked on the bar charts and networks. Cost and resource loading shall be indicated in the programs where required by the Engineer.

All programs shall be submitted in hard and soft copies.

10.2.2 Contractor’s Mobilization Program

No more than 30 calendar days after the Commencement of the Works, 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 of the Contractor’s and subcontractor’s key personnel.

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 input and reflect any agreements regarding responses outside the standard 30-day 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.

10.2.3 Design Submission Program

The Contractor shall prepare the Design Submission Program, developing it from the tender submission, which is to set 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.

The design submission program shall:

- 1) Be consistent with and its principal features integrated into the Detailed Works Program, and show all relevant major activities;
- 2) Identify dates and subjects by which the Engineer’s decisions shall be made;
- 3) Make adequate allowance for periods of time for review by the Engineer;
- 4) Indicate the design interface and coordination periods for each Interface Contractor;
- 5) Include a list of requisite design details for each and every component or equipment of all systems; and
- 6) Show the development, submission and review by the Engineer of all commissioning, maintenance, operations and training manuals and spare parts lists required by the Contract.

The Contractor shall update the design submission program suitably if the Engineer observes any deviation.

For 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 requirements description, life cycle calculations, type & 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.

10.2.4 Detailed Works Program (Project Implementation Program)

Within 28 days from the Commencement of the Works, the Contractor shall submit to the Engineer for review, a detailed Works program that includes, but is not limited to the following:

- 1) A PERT/CPM network diagram of all activities involved in the execution and completion of the works within the time for completion, identifying the critical path;
- 2) A time-sequenced bar chart based on the PERT/CPM diagram with the progress S-Curve super-imposed thereon, indicating the monthly progress estimates of accomplishments for every pay item in terms of percentages or quantities;
- 3) An updated construction methodology which shall embody a narrative description of the order of procedure in which the Contractor proposes to carry out each main item of work;
- 4) An updated Contractor's organization charts including:
 - a) A structural chart showing the hierarchical order of personnel the Contractor shall assign for supervision of the execution of the Works; and
 - b) Functional chart showing the respective duties, roles, etc., of every aspect of the chart.
- 5) A personnel schedule versus time showing the complement of personnel proposed for the execution of the Works;
- 6) An equipment schedule over time showing the complement of equipment for the execution of the Works;
- 7) A cash flow of payment schedule showing a detailed cash flow estimate, in monthly and quarterly periods, of all payments the Contractor shall be entitled to receive under the Contract; and
- 8) A time chainage diagram – showing a graphical representation of the major works including teams/gangs with chainage on the horizontal axis and time on the vertical axis.

The detailed works program shall show, inter alia, the following:

- 1) All procurement items including lead times and delivery times and dates;
- 2) Manufacturing activities indicating the relationship and duration of the activities necessary to procure, fabricate/manufacture, assemble equipment / complete car tests, shipping and delivery in time to support the activities on Site; establishing Schedule of Prices for monitoring the progress of the manufacturing process. The activities shall also cover works of subcontractors as appropriate, including testing;
- 3) The assembling section showing the construction of the car body, piping and wiring, installation of equipment and furnishing of the interior;
- 4) The Testing section shall show individual car tests and train consist tests;
- 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 activities shall present the testing approach and sequence to be used, the deployment of resources in accordance with Key Dates);
- 6) Integrated testing: The integrated testing activities indicating the activities required to verify the functioning of the Rolling Stock in conjunction with activities of the interface contractors;

- 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 activities shall indicate tests, measurements and interface tests required to be carried out to verify system performance and readiness for revenue service;
- 8) Times allowed for review of submissions especially where the Engineer or Contractor has to liaise with other parties;
- 9) The dates by which the Contractor requires information from the Engineer and/or interface contractor(s) (if any);
- 10) The dates by which the Contractor requires instructions from the Engineer to carry out work described in the Contract under Provisional Sums;
- 11) The delivery periods and dates of arrival on Site of all major plant and materials and their relationship with any climatic or hydrological constraints; and
- 12) The dates and periods during which the Contractor shall enter onto Sites allocated to other contracts for execution of its Works (if applicable).

10.2.5 Detailed Works Program Updating and Revisions

The Contractor shall revise the initial reviewed (Baseline) detailed Works program and re-submit at intervals as required under the Contract or as directed by the Engineer, however, the period between such updates shall not exceed one month.

In addition, the Contractor shall immediately advise the Engineer of any proposed changes in the program.

Revised changes in the program shall show all operations of each major item of work from the time of commencement to the anticipated completion date, thereby indicating the periods during which work was previously underway as well as estimated future periods of design, manufacture, construction operations.

Each revised program shall indicate time periods ahead or behind the schedule for both completed activities and future activities, relative to the baseline program. The revised program and supporting report shall describe the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the time for completion.

No revisions shall be made to the completion date, except as formally instructed by the Engineer through a variation order or supplementary agreement

10.2.6 Three-Monthly Rolling Program

Within 15 days from the commencement of the Works, the Contractor shall submit to the Engineer for review an initial Three-Monthly Rolling Program. The initial submission shall show in detail all activities that have commenced or are due to start within the first three-calendar-month period to meet Key Dates and any other dates set out in the Contract. Thereafter, the Contractor shall submit a new three-monthly rolling program every month as part of the Monthly Progress Report.

The Three-Monthly Rolling Program shall after the initial submittal:

- 1) provide details of all activities that are in progress, or are due to start, within the forthcoming two-month period (the previous one-month period shall also be shown);
 - 2) be updated every month and be submitted concurrent with the monthly progress report;
 - 3) highlight all required dates for transmittal or receipt of information to or from the Engineer, sub-contractors or interfacing parties; and
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- 4) consist of a three-month time window extracted from the detailed works program.

10.2.7 Three-Weekly Rolling Program

Prior to the start of the site mobilization and each week during the construction and testing and commissioning phases, a time-scaled Three-Week Rolling Program shall be prepared and submitted to the Engineer for each section of the Works. The Three-Weekly Rolling Program shall show in detail the current week's progress, and the following two weeks' plan. The program shall clearly tie into the Three- Monthly Rolling Program in all respects.

The activities shown on the Three-Weekly Rolling Program shall be an amplification of and compatible with the latest version of the Three-Monthly Rolling Program in all respects.

The Three-Weekly Rolling Program need not be computer-generated and does not require a detailed program analysis report. Any activity exceeding one week in duration shall be divided into sub-activities, the duration of which shall not exceed one week.

10.2.8 Other Programs

The Contractor shall provide any other programs or sub-programs of a particular portion of the Works as instructed by the Engineer.

10.3 MONTHLY PROGRESS REPORT

10.3.1 General

The Contractor shall prepare and submit to the Engineer, six (6) hard copies and one (1) soft copy of the Monthly Progress Report (MPR) detailing the progress and current status of the Works.

The MPR shall be submitted by the 7th day of each calendar month and shall account for all work actually performed from the first day of the preceding month up to and including the last day of that month. It shall be submitted in a format agreed with the Engineer and shall contain sections and sub-sections for but not be limited to, the topics listed below.

10.3.2 Executive Summary

The Contractor shall provide an Executive Summary covering the major achievements made during the reporting period, the activities planned for the next month and any issues that are affecting or may affect future works progress. These items are to be dealt with fully in the body of the report.

10.3.3 Financial Status

The financial status of the Contract shall include:

- 1) a narrative review of all significant financial matters and actions proposed or taken in respect to any outstanding matters.
 - 2) a spreadsheet summarizing the contract value, value of work during the period, value of work to date, remaining work value, cash flow forecast and variance (difference between cost forecast and contract value).
 - 3) a spreadsheet indicating the status of all payments due and made.
 - 4) a graphical presentation of cost forecast (S-Curve) and actual cost to date.
 - 5) a report on of the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.
 - 6) a report on the status of the Contractor’s claims and potential claims and variations.
-

10.3.4 Manufacturing Status

For the manufacture of each main item of plant/equipment or component thereof, the name of the manufacturer, manufacturer’s location, percentage progress, and the actual or expected dates of:

- 1) Commencement of manufacture.
- 2) Contractor’s inspection.
- 3) Tests and Commissioning.
- 4) Shipment and arrival at the Site.

10.3.5 Contractor’s Personnel and Equipment and Employer’s Equipment

A detailed description and record of contractor’s Personnel and Equipment and the Engineer’s and Employer’s equipment shall be provided by the Contractor, such as vehicles (if any).

10.3.6 Physical Progress

Detail description of work performed significant accomplishments, including critical items and problem areas, corrective actions taken or planned and other pertinent activities, and in particular, shall address interface issues, problems and resolutions.

It shall include a simplified representation of progress measured in percentage terms compared with percentage planned as derived from the current detailed works program and the baseline program.

10.3.7 Program Update

The detailed works program shall be updated by recording actual activity completion dates and percentage of activities completed up to the end of the previous month together with estimates of remaining duration and expected activity completion based on current progress. The program update shall be accompanied by an activity report and a narrative statement. The narrative statement shall explain the basis of the Contractor’s submittal:

- 1) Early work and baseline submittals - explaining determination of activity duration and describes the Contractor’s approach for meeting required dates as specified in the Contract.
- 2) Updated program submittals - stating in narrative the works actually completed and reflected along critical path in terms of days ahead or behind allowable dates.
- 3) Actual or potential delay to the Key Dates and/or the Contract Completion Date - identifying causes of delays and providing explanation of the Works affected and proposed corrective action to meet Key Dates or mitigate potential delays. Identify deviation from previous month’s critical path.
- 4) Identify by activity number and description, activities in progress and activities scheduled to be completed.
- 5) Discuss variation order work items, if any.

10.3.8 Program Status

The Program Status shall:

- 1) Show the detailed works program status up to and including the current report period, display cumulative progress to date and a forecast of remaining work; and
- 2) Be presented as a bar-chart size A3 and as a time-related logic network diagram on an A1 media, including activity listings.

10.3.9 Activity Variance Analysis

The activity variance analysis shall analyze activities planned to start prior to or during the report period but not started at the end of the report period as well as activities started and or completed in advance of what is indicated in the detailed works program.

10.3.10 Procurement Report

A summary of all significant procurement activities undertaken by the Contractor during the month, including actions taken to overcome problems shall be given.

A report listing major items of plant, equipment and materials that shall be incorporated into the Works shall be provided. The items shall be segregated by type as listed in the Specifications and the report shall show as a minimum the following activities:

- 1) Purchase order date - scheduled/actual.
- 2) Manufacturer/supplier and origin.
- 3) Letter of credit issued date.
- 4) Manufacturer/supplier ship date - scheduled/actual;
- 5) method of shipment.
- 6) arrival date in Philippines - scheduled/actual.

10.3.11 Production and Testing

A review of all production and manufacturing activities during the month shall be supplied to the Engineer.

Summaries of all production and manufacturing outputs during the month together with forecasts for the next month shall be given.

Review of all testing activities (either at Site or at the manufacturer's premises) during the month.

10.3.12 Defects Notification Management Plan

The Contractor shall submit for review by the Engineer three months before the delivery of the first train a Defects Notification Management Plan as part of the Monthly Progress Report, to describe DNP activities such as repair, replace and perform any remedial item upon the Works identified by the Engineer. The Contractor shall:

- a) Complete all necessary work in a timely responsible manner.
- b) Not proceed with any remedial work without the Engineers review.

- c) Detail the methods and timing of any proposed work.
- d) Update the plan monthly within the Monthly Progress Report, showing progress of the work and the time to completion.

10.3.13 Other Matters

The Contractor shall also include the following items within the MPR:

- 1) Key Dates and progress status - A report on the status of all work item is due to have been achieved during the month and forecasts of achievement of any missed Key Dates, and those due in the next month;
- 2) Three-Monthly Rolling Program - The monthly issue of the three (3) month rolling program;
- 3) Interfacing and coordination - A summary of all interfacing and coordination activities during the month with external interfacing parties and interface contractors and details of outstanding actions;
- 4) Safety - a review of all safety aspects during the month including reports on all accidents, actions proposed to prevent further occurrence, and safety statistics;
- 5) Environmental - 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;
- 6) Quality Assurance - a review of all quality assurance issues during the past month including all audits undertaken (internal and external) with a schedule detailing the status of outstanding actions.
- 7) Public relations issues including complaints received, public notices, consultation meetings, etc.
- 8) Weather and other conditions, including daily temperature range, humidity, rainfall, wind speed and direction, river levels etc.
- 9) Labor returns - summary of staff and labor employed on the Site.
- 10) Equipment - schedule of the Contractor’s equipment on Site with dates of arrival and departure as appropriate.
- 11) Material transportation status as per the approved material transportation plan;
- 12) Record of documentation submitted within the month including a schedule of all submissions and consents, approvals obtained, outstanding.
- 13) Monthly photographs and video productions.

10.4 MEETING REQUIREMENTS

10.4.1 Progress Meetings

The Engineer shall conduct progress meetings with the Contractor throughout the Contract period to enable an orderly review of the progress of the Works to be undertaken, and to provide for systematic discussion of problems and key issues. The Employer may or may not attend the progress meetings.

The frequency of the meetings shall be as determined by the Engineer, however, shall not be less than monthly.

The Contractor shall attend the meetings including the Contractor’s representative QC Manager and

Safety Manager and other key personnel as appropriate. Additionally, the Contractor shall ensure that its sub-contractors, suppliers and consultants attend meetings when so required.

The meetings shall follow an agenda to be issued forty-eight (48) hours prior to the meeting. The agenda may vary from time to time but shall in general be focused on progress made, measurement against Key Dates and Schedule of Prices, problems encountered and solutions to such problems.

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

The Contractor shall advise the Engineer at least twenty-four (24) hours in advance of progress meetings regarding items to be added to the agenda.

The Engineer shall compile minutes of each meeting and shall furnish to the Contractor for review and acceptance prior to issuance by the Engineer.

The agreed minutes of meeting shall be considered as formal correspondence and shall be binding on all parties. The meetings shall be held in a venue or by audio or video conference determined by the Engineer; however, to the maximum extent practicable, meetings shall be held at the Engineer's office.

10.4.2 Operation Meetings

Besides the progress meetings above, the Employer and the Engineer shall also conduct operational meetings with the Contractor and the operator as required. These meetings shall cover train operation issues related with the construction Works, including train operation, Works in the vicinity of the operator railway, window time and material transport, etc.

11 PARTS LIST, SPECIAL TOOLS AND TEST EQUIPMENT

11.1 DETAILS OF SUPPLY

Not later than two months before manufacture of a system, sub-system, the Contractor shall submit to the Engineer a parts list for delivery, including parts numbers, description, name and quantities for all delivery to be done.

The Contractor shall submit for review for the systems/sub-system one copy of a complete list of spare parts, special tools, jigs, fixtures and gauges, supplementing, adding or elaborating the list submitted with his Bid and finalized during the award, for the supply of spares during the Defects Notification Period. All additions shall be at no extra cost to the Employer.

11.2 MANUFACTURE AND DELIVERY

Spares shall be manufactured, works tested and delivered to the Employer by the Contractor, at such times as required by the Engineer, suitably packed and identified for prolonged storage.

They shall be considered and delivered in accordance with the Engineer’s instructions. The Engineer reserves the right to order spares to be inspected or tested on receipt and re-packed if approved. The information supplied in respect of each spare part or special tool shall include, but not be limited to, the following:

- 1) The manufacturer's part number.
- 2) Space for the Employer's part number.
- 3) 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. The detail of the breakdown shall be included as part of the submission under Sub-Clause 13.4;
- 4) Quantity supplied.
- 5) Expected utilization in twelve months.
- 6) Overall dimensions and weight including packing (if any) for shelf space purposes.
- 7) A note as to interchangeability or otherwise with similar parts.
- 8) The unit prices.
- 9) The source - the manufacturer's name and address.
- 10) The normal manufacturing and shipment lead times for additional quantities.

The presentation of the above information shall be reviewed by the Engineer on behalf of the Employer.

11.3 SPECIAL TOOLS AND TEST EQUIPMENT

One set of special tools, test equipment, jigs, fixtures and gauges required to carry out all functions described in the maintenance instructions or as required by the Particular Technical Requirements shall be delivered before the issue of Taking Over Certificate, which shall not be less than the list of equipment provided by the Contractor, along with his bid. The Contractor may add any additional equipment required, but, at no extra cost to the Employer. The extent of supply shall include protective or carrying cases, as may be appropriate for the storage and use of each item.

11.4 CAPITAL SPARES

The Contractor shall provide sufficient number of capital spares which shall not be less than the list of equipment provided with the Bid and finalized during the award, to ensure that the operation of the MMSP shall not be interrupted for longer than it takes to install the capital spare or to ensure that the

operation of the system is not degraded longer than the time it takes to expedite the spare. The Contractor may provide additional capital spares, but at no extra cost to the Employer.

11.5 CONSUMABLE SPARES

The Contractor shall provide all spare parts for all of its supplied equipment necessary during the Defects Notification Period, the price of which shall have been included in the Schedule of Prices.

The spare parts shall be listed in a practical format.

The stock of all consumable spare parts shall be replenished at the end of the Defects Notification Period to match as a minimum the list of consumables of the bid and be handed over to the Employer.

11.6 START-UP MATERIAL

The Contractor shall provide all material for testing and commissioning and sufficient material to start the service.

11.7 SPARE PARTS INSTALLATION SUPPORT

The Contractor shall provide sufficient maintenance support staff to ensure that the all spares can be efficiently installed during the Defects Notification Period.

11.8 (NOT USED)

11.9 TRAIN OPERATION SIMULATOR

The Contractor shall transport, set up and adjust the train operation simulator by the designated date.

12 INSPECTION, TESTING AND COMMISSIONING

12.1 GENERAL

The Contractor shall perform all necessary testing and commissioning activities in order to ensure satisfactory operation of the Rolling Stock completed system plus compliance with the requirements of the Technical Requirements in MMSP section and interoperability section. The Engineer shall witness the tests as set out in the test plan.

The test of on Board Signaling and Communication Equipment provided by the CP106 and CP NS-02 Contractor shall be part of the test plan and the technical responsibility for integrated performance remain with the CP106 and CP NS-02 Contractors.

All inspections, testing and commissioning shall be clearly identified in the Quality Management Plan identifying the witness, inspection and hold points as required by the Contractor, the Engineer or both. The quality management plan shall be submitted by the Contractor to the Engineer for review in accordance with the Quality Management Plan (refer Sub-Clause 7.1).

All tests shall be carried out by the Contractor in the presence of the Employer and the Engineer in accordance with the agreed Quality Management Plan.

The Contractor shall provide testing procedures that shall be in accordance with the Technical Requirements and the International and Philippine Standards (as specified in the Technical Specification Sub-Clause 1.2.2, Codes, Standards and Requirements).

The Contractor shall appoint a dedicated test and commissioning manager, to coordinate all activities of the commissioning schedule.

All costs associated with testing shall be borne by the Contractor, including any expenses incurred due to re-testing caused by defects or failure of equipment to meet the requirements of the Contract in the first instance.

The cost of permanent power which is consumed in testing and commissioning by the Contractor as part of the Works shall not be the responsibility of the Contractor.

The cost to provide water and other services including train operation personnel (train operators and rolling stock personnel) required for inspection, testing and commissioning including integrated testing and commissioning and trial run shall be borne by the Contractor. Train operator and associated rolling stock personnel required for all Interfacing Contractors will be provided by the CP107 Contractor as required for the completion of testing & commissioning.

Inspection, Testing and Commissioning

The following System Integration Tests and Interface Tests with the interface Contractors shall be covered in the Inspection, Testing and Commissioning Plan submission.

The CP107 Rolling Stock Contractor shall mention the responsibility and demonstration of the design of the Rolling Stock are compliance with the system integration and interface requirements for the interoperation with NSCRP_Soperation:

- System Integration Tests with NSRP-S
- Interface Tests with CP NS-01 E&M Systems and Track Works of NSRP-S
- Interface Test with CP N-06 and NS-02 for NSCR Rolling Stock (if needed)
- Any operation and maintenance test as agreed with by the Engineer of NSRP-S.

12.2 INSPECTION, TESTING AND COMMISSIONING PLAN

According to Sub-Clause 22.2.2 of the ERT the Contractor shall submit to the Engineer for review an inspection, testing and commissioning plan giving full details of all tests to be carried out under the Contract with an explanation of the planned achievements.

The plan shall demonstrate that the Rolling Stock conforms to specifications, standards and other normative documents.

Testing and commissioning shall be in accordance with the Railway Application Standard JIS E4041 for testing of Rolling Stock or on completion of construction and before entry into service and according to Clause 22 of the ERT.

The inspection, testing and commissioning plan shall include as a minimum the following tests:

- 1) Design Qualification Testing: As part of the design verification process, type tests shall be carried out to demonstrate that the design of the Rolling Stock and its systems are in full compliance with the requirements;
- 2) First Article Inspection: The first component produced shall be subjected to a rigorous test and inspection to confirm that the hardware fully complies with the Contractor’s design and manufacturing process requirements;
- 3) Factory Acceptance Tests: Tests to be performed at the factory, before equipment is shipped as it is set out in the Sub-Clause 22.4.2 of the ERT;
- 4) On-Site Testing and Commissioning: Tests to be performed after delivery of the Rolling Stock at the Site comprising static and dynamic tests. After static tests at the depot, dynamic tests shall be carried out on the main line; and
- 5) Trial Operations: The Contractor shall undertake Trial Operations which shall take place at the completion of the testing and commissioning process. The Trial Operations shall be supported by the Engineer and other interested parties. It consists of operating the newly procured Rolling Stock, consideration simulating requirements of operating the trains for revenue service, but without active passengers.

12.3 TEST PROCEDURES

The Contractor shall supply his proposed Test Procedures for review by the Engineer 3 months prior to the scheduled commencement of the testing (refer to Sub-Clause 22.6.1 of the ERT).

12.4 CONDITIONS PREREQUISITE TO INSPECTION BY ENGINEER

Written notice submitted by the Contractor requesting Inspection shall mean that the work is ready and the Contractor have themselves:

- 1) Inspected and checked all work completed;
- 2) Compared all work with the drawings, specifications, and submittals as approved;
- 3) Confirmed that all conditions, provisions and requirements of the Contract documents have been fulfilled, other than any maintenance and incidental work and procedures necessary to follow; and
- 4) Systems, equipment and devices are properly adjusted, serviced, tested and fully operable.

12.5 TEST INSTRUMENTS

All test instruments used during the testing and commissioning phases shall be calibrated in accordance with industry standards. Calibration test certificates shall be supplied in duplicate at the Contractor's expense and shall be signed and dated clearly identifying the type of test equipment, serial number, date of calibration test and expiry date of the calibration period. All calibration checks shall be undertaken prior to testing and, if required by the Engineer, shall be repeated afterwards.

All test instrumentation shall carry a self-adhesive calibration identification label which clearly identifies the serial number of the equipment, the date when calibrated and the expiry date of the calibration.

12.6 TEST REPORTS

After completion of each test, whether witnessed by the Engineer or not, the Contractor shall no later than fifteen (15) additional elapsed days prepare and forward the Test Report to the Engineer for review (refer to Sub-Clause 22.6.2 of the ERT). A punch list shall be created that identifies any deficiencies and or deviations from the approved detailed design and shall be attached to the test results.

12.7 COMMISSIONING COORDINATION

The Contractor shall appoint a test and commissioning manager who shall work very closely with the Engineer to coordinate all activities of the commissioning schedule.

The Contractor shall ensure that they have produced the testing & commissioning procedures and reports for the Rolling Stock and as far as is practicable, they have advanced the Rolling Stock testing. In the areas where the CP106 Contractor has scope of work, etc. driver’s cab, signaling, installation, then the CP106 Contractor shall take the lead for the integrated testing & commissioning in areas like CP107 and CP106 Contractors, e.g.

The on-board signaling equipment for CBTC shall be provided by the CP106 Contractor, as is described in Clause 16 of the ERT and that for ETCS-Level2, the equipment for Running and Stopping Assistant System and the equipment for PSD Controller shall be provided by the CP NS-01 Contractor for MCRP/NSRP-S project as it is described in Section 18 of the Technical Requirements.

13 OPERATING AND MAINTENANCE MANUALS, RECORD DRAWINGS

13.1 GENERAL

No later than two months prior to commissioning, the Contractor shall submit to the Employer and the Engineer for review, six (6) preliminary copies of operating instructions, maintenance instructions, maintenance drawings and illustrated parts catalogs (IPC) for the Rolling Stock in accordance with the requirements stated herein and Section 21 of this ERT.

13.2 OPERATING AND MAINTENANCE INSTRUCTIONS

The Operating & Maintenance instructions shall be in sufficient detail to enable the Employer to operate, maintain and repair each part of the electrical and mechanical system. This shall include but not be limited to the following.

- 1) A description of all the equipment and its component parts.
- 2) Original Equipment Manufacturer’s brochures shall be in English language.
- 3) The characteristics, ratings and any necessary operating limits for all the equipment;
- 4) Recommended interval of inspection/replacement.
- 5) Inspection/measuring point/item and criteria.
- 6) Instructions for lubrication and recommended lubricant;
- 7) Instruction of removing and re-installing consumable parts;
- 8) Instruction on dismantling and re-assembly at overhaul; and
- 9) Testing and re-commissioning procedures after re-assembly, overhaul or replacement of equipment.

The approved version of all manuals shall be provided in electronic format, indicating revision and which shall not allow changes and six hard copies, properly bound and oil and dirt resistant.

13.3 AS-BUILT DRAWINGS

Drawings showing the Works as-built, shall be prepared by the Contractor and submitted for approval. The Contractor shall submit to the Employer six (6) prints of each drawing and six (6) copies of the electronic files. The electronic format shall be as approved by the Employer.

13.4 MAINTENANCE DRAWINGS

The Contractor shall provide maintenance drawings as it is required for the maintenance of the Rolling Stock by the Employer. Drawings shall be provided as detailed by Section 21 the ERT.

Information contained on the drawings shall include but not be limited to:

- 1) Setting dimensions, parameters and tolerances, specifications, ratings, etc.
- 2) Sizes and materials of all fixtures and threads.
- 3) Weights of assemblies.
- 4) Wiring diagrams to appropriate standards, including internal wiring of sealed unit items.
- 5) Type and manufacturer’s codes of parts sub-assemblies.

The approved version of all drawings shall also be provided in electronic format which shall not allow changes. Six (6) properly bound with oil and dirt resistant hard copies shall be provided.

13.5 ILLUSTRATED PARTS CATALOGS

The Contractor shall submit six (6) copies of complete illustrated parts catalogs (IPC) and overall "exploded views" of assemblies and sub-assemblies for Rolling Stock which shall include also reference to all assemblies, sub-assembly special tools, jigs, fixtures and gauges required for the operation and maintenance of the Rolling Stock. All sub-assemblies shall have separate detailed specification and part numbers for ordering/re-ordering requirements.

The IPC shall be provided in electronic format, the format shall be approved by the Engineer and for hard copies properly bound and oil and dirt resistant.

13.6 MODIFICATIONS, CONFIGURATION TRACKING

The Contractor shall provide a vehicle history book for each vehicle at the time of acceptance. Each vehicle history book shall contain the vehicle specific information as well as the history of all maintenance and modifications as it is set out in the ERT (refer to Sub-Clause 21).

It may prove the case that the Contractor shall need to amend his submissions during commissioning of the Rolling Stock and or during the Defects Notification Period.

In this case it is the Contractor’s responsibility to document and to show the change of the configuration. This shall be amended to the History Book. This shall also include the tracking of the software release in case of updating software, operating and maintenance instructions, maintenance drawings, As-built drawings and IPC, etc.

14 TRAINING

14.1 TRAINING REQUIREMENT

The Contractor shall train or arrange training for Employer’s Personnel in accordance with the requirements of the Railway Operator’s program. These staff shall include the Railway Operator’s key instructors who shall require training in technical matters in order to conduct future training courses.

The Contractor shall assume on the part of the Employer’s personnel that they are starting on the premise of zero (0) knowledge of the equipment, etc. and the training must be designed to upgrade the delegate’s knowledge to that where they are proficient.

Training shall include provision of all required training materials, appropriate training venues, competent instructors, plant, equipment and all necessary aids to support training courses.

The Contractor shall recognize the dates for Trial Operations and shall ensure that all appropriate personnel have received adequate training to equip them for all of the tasks required during Trial Operations before the commencement of the Trial Operations.

Additional training may be required during Trial Operations as may be identified by the Employer or Engineer.

14.2 TRAINING OBJECTIVES

The Contractor shall provide comprehensive training to the Employer’s personnel to enable all of the systems and equipment supplied, installed or modified to be operated and maintained in the designated manner safely and efficiently so as to achieve the maximum reliability and economy.

Training objectives in terms of minimum standards to be achieved by each trainee role shall be clearly defined by the Contractor.

14.3 TYPES OF TRAINING

The Contractor shall be required to provide training for:

- 1) Operations staff who are required to operate the equipment or system under normal, degraded and emergency situations and recover from minor faults;
- 2) Maintenance staff who will undertake recovery or corrective maintenance, routine or preventive maintenance and specialize in repair and overhaul of Rolling Stock equipment;
- 3) Engineering Staff who are technical support staff specializing in system administration, fault analysis and investigation techniques associated with the particular type of equipment and system; and
- 4) Key instructors who shall be required to develop the skills necessary to conduct future training courses.
- 5) Recovery and emergency repair instructions with special tools for incidents such as derailment and split train.

The Contractor shall provide additional training and training materials where appropriate to impart the skills and knowledge required for the maintenance and/or operation of any part of the Works which is subjected to modification under the Contract.

14.4 TRAINING PLAN

The Contractor shall submit a Training Plan to the Employer and the Engineer for review within twelve (12) months from the Commencement Date.

The Training Plan shall provide a structured training program to educate and train the Employer’s personnel in all aspects of the system operation and maintenance and shall include, but not be limited to, the following:

- 1) Approach to structuring and providing the courses required.
- 2) Schedule of training courses.
- 3) Title, objective, syllabus, method, location, number of classes, class size, course contents and estimated duration of each training course.
- 4) List of training materials, documentation and equipment to be included with the training courses.
- 5) Testing and assessment to be utilized.
- 6) Qualifications and experience level necessary for the trainees;
- 7) Qualifications of Contractor’s instructors.
- 8) Course evaluation methods.

The Contractor shall use a modular approach in developing the training curriculum in order to facilitate the O&M trainers to adopt the courses for different level of staff who may have different needs in terms of depth of knowledge and skills of a specific system.

14.5 TRAINING METHOD

The training shall be planned and carried out in a manner suitable for the intended role, and shall at a minimum consist of the following.

- 1) Classroom (theory) training.
- 2) Practical (hands on) training.

Other training methods for example, computer based interactive, computer-based training (CBT) simulator training, on-the-job training shall be adopted where applicable.

All training courses shall be conducted in English.

14.6 TRAINING LOCATION

The training shall be carried out at such locations where the greatest benefit for trainees may be gained. This may be in the Philippines, at places of manufacture, assembly or testing, or at such other locations as may be necessary. All places of training shall be subject to the approval of the Employer.

The Contractor shall be responsible for the reception of employees, plus hotel and travel arrangements and costs for each trainee in regions other than Manila.

14.7 CONTRACTOR’S TRAINING STAFF

The Contractor shall provide competent instructors to carry out training to a high degree of proficiency in areas where the Contractor has the specialized knowledge. All instructors shall have a good command of English language and training skills. Should, in the opinion of the Engineer, any of the Contractor’s instructors not be considered to be competent or do not have a suitable aptitude for carrying out training courses for whatever reason, the Contractor shall remove the said person and replace him or her as soon as possible with a competent substitute.

The Contractor shall assign a training coordinator from his organization to be responsible for training. The training coordinator shall be the main contact for all matters related to training.

The Contractor shall provide full time on-site management and coordination of the training to ensure continuity of classes and proper distribution of training materials and to be responsible for interfacing with the Contractor’s instructors.

Where the trainees are attached to the Contractor or his subcontractors for the purpose of gaining job experience, all such trainees shall be properly supervised and monitored by a qualified training supervisor to ensure that each trainee has the best opportunity to benefit from the practical experience.

14.8 PRE-REQUISITE OF TRAINEES

The Contractor shall submit measurable criteria for selection of trainees, indicating minimum standards desired in each course, in terms of:

- 1) qualification and or educational standards required.
- 2) skills and knowledge levels desired, or any special aptitude necessary.
- 3) oral and written ability.

14.9 TRAINING MATERIALS, PLANT AND EQUIPMENT

The Contractor shall provide at their own cost, such written or printed matter, samples, models, cut-away equipment, devices, slides, films and other instructional material, as may be necessary for training. Such materials shall be retained by the Employer at the end of the training.

Manuals to be used during training shall be developed based on the O&M Manuals and delivered to the Engineer at least eight (8) weeks prior to the commencement of the first training session of the course for review and comment. The manuals shall be accurate, complete and of professional quality.

The Contractor shall provide a full set of training manuals, including an individual training plan, an instructor guide and a trainee manual for each training course. The instructor guide shall include the course agenda, objectives, list of resources and facilities required, detailed lesson plans, presentation notes, discussion guides, training aids, test papers, criteria and methodology for testing and assessment, and all other things that shall enable the railway operator’s key instructors to roll out the training.

All training manuals shall be written in English and in a specified standard format.

All training manuals are to be submitted to the Engineer for the review initially with further copies dispatched during the training delivery including a soft copy that allows easy reproduction.

In general, the Contractor shall use plant and materials specifically set aside for training purposes. However, the Contractor may use, subject to the agreement of the Engineer, installed plant and equipment when no other such plant and materials are otherwise available. The Contractor may use spare parts or assemblies that form the Contractor’s spares for this purpose, provided that the Contractor shall replace any component or parts which incurred damaged due to mishandling and improper procedure during the training at no cost to the Employer.

The supply of training materials and equipment shall be sufficient both for the trainees trained by the Contractor and for those to be subsequently trained in the rollout training.

14.10 TESTING AND ASSESSMENT

The Contractor shall conduct periodical theoretical and practical tests for all trainees to assess the level of knowledge and understanding of the course content.

The Contractor shall, at the completion of each training course, issue an appropriate certificate to each trainee who has successfully completed the course.

14.11 MONITORING & COURSE EVALUATION

The Engineer and railway operator’s relevant department shall have free access to all training sessions to monitor the progress of the trainees and the Contractor’s instructors.

The Contractor shall, at the conclusion of each training course, issue questionnaires to all trainees directed at determining the level of satisfaction with the course content.

The Contractor shall review the responses to questionnaires and forward a summary to the Engineer. If the Engineer considers that the course has not achieved the required objectives, the Engineer shall advise the Contractor who shall then organize and implement appropriate re-training at no additional cost.

14.12 RECORDS

The Contractor shall permit the Employer and railway operator to record video images of any of the training and to have the right to use these recordings at any time.

The Contractor shall, at the completion of each training course, provide the Engineer with a consolidated training record listing the course title, date of training, name of all trainees, training result and relevant information.

Training records shall be kept up-to-date and made available to the Employer or to his representative for examination when required to do so.

14.13 ADMINISTRATION

The Contractor shall:

- 1) be responsible for the safety, health and general welfare of trainees under his control; and
- 2) submit for the Employer’s approval, procedures which shall enable them to control, and to repatriate where necessary those trainees not found to be responding to training as a result of aptitude, discipline and any other cause.

15 EQUIPMENT IDENTIFICATION

All labels on any piece of equipment, cable, pipe, etc. shall be identified as shown on the approved drawings and or circuit diagrams.

All equipment and materials supplied shall be indelibly labeled or otherwise identified to show its identity, type, version, function, location, rating or limitation as appropriate. Removable modules such as relays, breakers, etc. shall have the same indelible labeling on the fixture to which the module is attached. The label shall be adjacent to or on the module and shall not be obscured.

All warnings, instructions or identification labels shall conform to current directives and a unified system of labelling for all services shall be used subject to the approval of the Engineer.

All wires shall be labelled at connection of terminal or connectors with identifying numbers indicated in wiring diagrams and terminal numbers or pin numbers of connectors.

All labels used shall be highly durable, scratch and chemical resistant and have high UV resistance.

16 PUBLICITY AND PUBLIC RELATIONS

16.1 GENERAL

The Contractor shall prepare and submit a Public Relations (PR) plan as part of the Project Management 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:

- 1) Coordinate public relations matters and exercises with the Engineer and keep the Engineer informed at all times of relevant issues;
- 2) Engage and liaise with relevant local government departments, other authorities and key stakeholders to develop and coordinate public relations exercises;
- 3) Establish a sense of partnership among the government and stakeholder groups in the implementation of the Project;
- 4) Promote the Project to the public and the parties concerned with a positive message and explain the benefits which shall be realized by the development of the Project;
- 5) Gain support and minimize objections from the community and concerned parties;
- 6) Ensure adequate transparency of the Project to the public and key stakeholders;
- 7) Implement a robust process for receiving, addressing and tracking comments, criticism and complaints from all parties during the Contract;
- 8) Resolve public relations issues arising during the course of construction and elevate major issues to the Employer via the Engineer, as required;
- 9) Prevent and/or mitigate any nuisance or disturbance to the public due to the construction activities at the earliest possible time;
- 10) Attend and answer queries for the purpose of public consultation including but not limited to LGUs, MMDA, PNR, Emergency Services, Stakeholders, the 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;
- 11) Prepare and supply all necessary drawings, photomontages, documents, consultation papers, presentations, display materials, etc. for public consultations; and
- 12) 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.

16.2 PUBLIC RELATIONS PLAN

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 MMSP 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 the future, throughout the Contract period.

16.3 PUBLIC CONSULTATION

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

- 1) 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;
- 2) Attend and participate in all public consultations and PR exercises;
- 3) Gain support, ease concerns and minimize objections from the public affected by the construction works through public consultation;
- 4) Address public concerns and feedback as far as possible to minimize disturbance to the public during construction, at the Contractor’s own expenses; and
- 5) Report and give presentations to the Engineer, Employer, stakeholder agencies, NGOs and local authorities of the affected areas, 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, feedback 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.

16.4 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.

16.4.1 Newsletter

The Contractor shall design and produce newsletters with the guidance of the Engineer at three-monthly intervals throughout the construction period and distribute to concerned Government departments, the Employer, stakeholders, related competent agencies, NGOs or individual members of the public, local authorities and people in the affected areas, etc. The newsletters shall be published in both English and Filipino Language providing in depth descriptions of the MMSP Project and the latest development and construction progress of the Works. It shall highlight the benefits of the Project, Schedule of Prices events of the construction activities and mitigation measures taken to minimize the impact to the public. Ways of communication channels shall also be published in the newsletters such as the website, and phone numbers of the enquiry hotline.

16.4.2 Website

The Contractor shall establish a website with the guidance of Engineer and Employer which gives a clear description of the MMSP, 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.

16.4.3 On-Site Notice

The Contractor shall post on-site notices with the guidance of the Engineer with a clear description of the Works and indication of anticipated completion dates 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.

16.4.4 Hotline

The Contractor shall set up a twenty-four (24) hour hotline with the guidance of the 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.

16.4.5 Construction Site Tour

The Contractor shall cooperate with and provide periodic 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 MMSP. Tours shall be planned at least once in every three months, subject to the Engineer’s review.

16.4.6 Coordination with Other Contractors

The Contractor shall coordinate with external interfacing parties and interface contractors in the implementation of public relations activities.

16.4.7 Measurement and Payment

No separate payment shall be paid for preparing and submitting the public relations plan, public consultation, and public relation tools all associated costs shall be deemed to be included in the other BOQ items describe above.

17 (NOT USED)

18 REQUIREMENTS MANAGEMENT

18.1 GENERAL

The Project Management Plans specified in Section 1 of the General Requirements (ERG), together with all other plans listed therein will initiate the required actions to demonstrate compliance with the Project requirements. These requirements can be large in number, may vary in complexity, and may be potentially difficult to manage; therefore, it is best practice for a database to be established to capture all of these requirements. This database is known as the Requirements Management Database. The Contractor shall establish this database and shall ensure that it is maintained and updated throughout the life cycle of the project to support design submissions and closure of the project by providing compliant Verification and Validation (V&V) to the Employer’s Requirements.

Requirements Configuration Management shall be applied for the management of changes to be achieved, to ensure that at any time all parties are working to the same requirements and on the same versions of documentation.

Requirements configuration will be achieved by the generation of baselined requirements and specifications, by associated design verification and validation, and by the application of the Contractor’s change management process.

The Requirements Management Database shall be populated with defined requirements from the Employer Requirements and in such requirements shall include, but not be limited to the following:

- 1) Scope of Work (SOW).
- 2) General Requirements (ERG).
- 3) Technical Requirements (ERT).
- 4) Conditions of Contract (CoC).
- 5) Particulars Conditions (PC).

The implementation of the Requirements Management Database and V&V activities shall ensure that:

- 1) No requirement is missed or overlooked;
- 2) The Contractor can actively demonstrate that they have searched and are in receipt of all requirements; and
- 3) The Contractor can demonstrate to the Engineer and the Employer that they have taken all reasonable and practicable steps to ensure that all Project requirements have been identified and satisfied.

18.1.1 Requirements Verification and Validation (V&V)

The Requirements Management Database shall be populated with V&V evidence. The V&V processes aim to reduce risk and evolve a fully integrated system in order to provide confidence in the ‘as designed’ and the ‘as built’ solutions.

18.1.2 Verification

The Contractor shall provide statements of the design elements that constitute the acceptance criteria of each requirement. These acceptance criteria are to be reviewed by the Engineer. On completion of a design, the Contractor shall provide compliance statements and evidence to show the verification of the design against each requirement, with this evidence to be reviewed by the Engineer.

Verification is the confirmation by examination and provision of objective evidence that the specified requirements have been fulfilled in the design. This evidence shall be provided from:

- 1) Design reports.
- 2) Material Certificates of Conformance.
- 3) Similar applications.

18.1.3 Validation

The Contractor shall provide methods of validation to demonstrate that the design intent has been met, with the acceptance criteria to be reviewed by the Engineer. On completion of the validation, the Contractor shall provide compliance statements and evidence to show that the functionality of the design intent has been met in the Build, with this evidence to be reviewed by the Engineer.

Confirmation of validation shall be achieved by examination and provision of objective evidence that the particular requirements for a specific design and its intended use have been fulfilled in the Build. This shall be from evidence provided via:

- 1) Quality Assurance.
- 2) Inspection.
- 3) Testing and Commissioning.
- 4) Performance Monitoring.

18.2 REQUIREMENTS MANAGEMENT PLAN

In order to define how the requirements will be managed throughout the lifecycle of the Project, the Contractor shall provide a Requirements Management Plan which defines the requirements management process and the processes for the V&V stages together with change management requirements.

The Requirements Management Plan shall include but not be limited to, the following:

- 1) A traceability system that tracks and demonstrates all aspects of the design and engineering contract package that fulfils the Employer’s Requirements and Specifications;
- 2) Setting out the strategy for V&V so that all parties may have a common understanding;
- 3) Specifying the approach to be used on the Project, such that:
 - a) Requirements specifying systems, characteristics and context of use are defined in the Requirements Management Database;
 - b) Constraints that affect the design of the Project systems and the means to achieve it are defined;
 - c) Requirements for which verification is needed are identified.
 - d) Requirements for which validation is needed are identified.
 - e) Requirements which have an impact on safety are identified in conjunction with the other aspects of Systems Assurance.
 - f) Demonstrable traceability between requirements and the design.

- g) Demonstrable traceability between the design and inspection and/or test reports.
 - h) A defined basis for confirming with objective evidence that requirements are satisfied within the Project Implementation Program.
 - 4) Definition of the responsible persons and their respective roles regarding V&V.
 - 5) Identification as to when key V&V activities are to be performed.
 - 6) Application of all phases of the Contract and all requirements irrespective of their source and applying the same processes for all requirements with regard to traceability.
 - 7) Ensuring the Contractor uses their plan to expand on the V&V activities shown in their project quality plans.
 - 8) Verification Process:
 - a) The purpose of the verification process is to determine that the output items of each stage of the Project life cycle commencing from the technical design stage, and to fulfil the requirements of the previous stage, and to demonstrate this fulfilment with objective evidence;
 - b) The process involves individuals who are independent for the checking of the above (all within the Engineer's organization, but adopting independent roles within the Requirements Management Database process).
 - c) Offering output in the form of a traceability report and verification report.
 - 9) Validation Process:
 - a) The purpose of the validation process is to determine whether or not the implemented system meets the requirements in terms of use or application and to be demonstrated with objective evidence.
 - b) Design requirements that are flagged for validation must be linked to the related inspection and test procedures.
 - c) Inspection and test procedure shall be records into the requirements management database.
 - d) A requirement is considered to be validated when the corresponding inspection or test report has been linked to the relevant inspection test procedure and has been reviewed by the Engineer.
 - 10) Requirements Change Control Management
Within the overall Requirements Management system, the Contractor shall provide a change control management system to be reviewed by the Engineer, by which any changes in the requirements are managed to ensure that all parties are working on the same revision of requirements.
 - 11) Reports
 - a) There shall be a mechanism for allowing different reports to be derived from the V&V system e.g. design verification tables, which shall be reviewed by the Engineer.
 - 12) Ongoing assessment
 - a) The Engineer reserves the right to further validate the documentation of V&V on an ongoing basis for safety-related and safety-critical systems to the relevant standards;
 - b) In this case, the validation may be performed within the existing arrangements or carried out by another agency as nominated by the Engineer / Employer; and
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- c) If this latter case applies, then the Contractor shall be required to supply relevant documents to the validation agency, as requested by the Engineer.

19 (NOT USED)

20 INTERFACE MANAGEMENT

20.1 GENERAL

The Contractor’s responsibility for interface coordination shall include interfacing with the following 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.

The Contract Package shall be stated as follows:

- 1) CP107: Rolling Stock for MMSP;
- 2) CP106: E&M System and Track Works for MMSP;
- 3) CP NS-01: E&M System and Track Works for MCRP/NSRP-S;
- 4) CP101 partial operation section Civil work and DEPOT for MMSP; and
- 5) CP102,103,104,105,106,107 and 108 Civil work for MMSP

The contractor shall submit Interface Milestone Program so that key milestones on the exchange of design information between the rolling stock Contractor and the other contractors can be defined. It shall be reviewed by the Engineer.

20.2 EXCHANGE OF INFORMATION

The Contractor shall communicate, coordinate and exchange information directly with external interfacing parties and interface contractors. Information necessary to fulfil the Contractor’s interface obligations shall be directly requested and obtained from the external interfacing parties and interface Contractors. Information receipt and acknowledgment procedures shall be implemented by the Contractor. Conversely, the Contractor shall provide information which is related to the Contractor’s scope of work, as required, directly to the relevant external interfacing parties and interface contractors.

The Contractor shall communicate and cooperate with the interface contractors to identify and resolve potential interface problems and to coordinate the works.

The Contractor shall allow for the fact that many of the design activities of the interface contractors may proceed concurrently with the 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), acknowledgement of receipt of information, and any official communications between the Contractor and the interface contractors/external interfacing parties shall be made in writing with a copy to the Engineer for information.

20.4 INTERFACE AND COORDINATION

The Contractor shall advise the Engineer in writing of any problems encountered in obtaining necessary information or lack of cooperation from any interface contractor / external interfacing parties. In the event that the Engineer considers that the resolution of an interface is not proceeding satisfactorily, the Engineer shall review the matter and establish a coordinated plan directing the Contractor and the interface contractors as to the required action.

The Contractor is responsible for detailed coordination of their design and manufacturing 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 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 coordinate. Such coordination responsibilities of the Contractor shall include the following, but not be limited to:

- 1) 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 Schedule of Prices and work program dates, if any.
- 2) Ensure that the Contractor's requirements are provided to all other interface contractors, in a timely and reasonable manner.
- 3) Obtain from the Interface contractors' information reasonably required, to enable the Contractor to meet their own design submission dates.
- 4) 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.
- 5) To ensure that there is no interference with the works of the interface contractors.
- 6) 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 meeting shall prepare minutes recording all matters discussed and agreed at the meeting.

The Contractor shall establish a dedicated coordination team, 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.

The coordinator shall assess the progress of coordination 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.

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.

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 for by the contractor in his design of the Works.

During the course of the Contract, information shall be obtained in a number of ways, including direct inspection, regular Site meetings, the obtaining of progress reports and the use of turnaround 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.

20.5 MEETINGS WITH EXTERNAL INTERFACING PARTIES AND CONTRACTORS

The Contractor shall conduct regular meetings with the external interfacing parties and 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 the date, time and location of such meetings as they 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 the 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 the interface contractors or external interface parties resulting directly from the Contractor's failure to keep to specified dates or due to incorrect or delayed information provided by the Contractor, 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 COORDINATION WITH INTERFACE CONTRACTORS

The Contractor shall undertake design coordination with the 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 coordination period indicates the deadline for receipt by the Engineer of a notice from the Contractor and each of the interface contractors stating that design coordination 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 shall include the following:

- 1) Definition and agreement with interface contractors of interface areas, contract limits, shared loads, physical work interfaces, sequence of installation and/or testing of systems;
- 2) The Contractor shall fully coordinate the design of the Contract works with the design of interface contractors and shall follow the interfacing requirements detailed in the ERT;
- 3) 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 contractors and other contractors in accordance with

the requirements of the ERT.

- 4) Definition and design approach by the Contractor with the 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.
- 5) Combined services drawings, i.e. drawings showing the locations, layouts and sizes of all services, shall be managed, so as to eliminate all clashes with interface contractors’ requirements.

20.9 CONSTRUCTION INTERFACE AND COORDINATION

The Contractor shall undertake installation during periods for installation interfacing and coordination. The installation interface and coordination 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 each 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 their principal installation work within the given areas to which access has been given.

The Contractor shall coordinate and cooperate with the 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:

- 1) Conduct on-site inspections of the work elements, and give comments in writing to the interface contractors; and
- 2) Agree in writing to the interfacing parties that the as-constructed work meets the interface requirements.

20.10 INTERFACE REQUIREMENTS WITH EXTERNAL INTERFACING PARTIES

The Contractor shall as and when required interface with other railway disciplines and outside authorities as well as contractual responsibilities with the Employer. These interface requirements and obligations shall include but are not limited to the following:

- 1) DOTr;
 - 2) The operator
 - 3) All other railway disciplines (signaling, overhead catenary system, civil, power, communications, Rolling Stock etc.);
 - 4) Local Authorities (municipalities, barangays etc.);
 - 5) DPWH;
 - 6) MERALCO;
 - 7) Telecom amenity suppliers;
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- 8) National Telecommunications Commission (NTC)
- 9) Police Authorities.
- 10) Philippine Government departments (local and national).

20.11 INTERFACE MANAGEMENT PLAN

- 1) The Contractor shall develop and submit for the Engineer’s review an Interface Management Plan within 42 days following the commencement of the Works, which is mutually acceptable to both the Contractor and the interface contractors. The Interface Management Plan shall:
 - a) Identify the equipment as well as the civil works and facilities with interfacing requirements;
 - b) Define the authority and responsibility of the Contractor's and Interface Contractors' (and any relevant subcontractors') staff involved in the interface management and development;
 - c) Identify the information to be exchanged, precise division of responsibility between the Contractor and interface contractors and integrated tests to be performed at each phase of the Contractor's and interface contractors' works.
 - d) After the review of the interface management plan by the Engineer, the Contractor shall execute the works in accordance with the Plan;
 - e) Require the contractor to identify all interfaces with third parties, Subcontractors and the designated Contractor for other packages. The Contractor shall be responsible for liaising with the interface partners;
 - f) Establish the methods and procedures used by the Contractor for controlling and ensuring compatibility of physical, functional and environmental interfaces of Contractor-supplied equipment with the Employer’s systems or equipment and other facilities under construction and/or under the control of the Employer;
 - g) Establish the requirements, methods and procedures to ensure formal, accountable channels of communication for the exchange of technical information; and
 - h) Such methodology shall include both initial definition and formal change information when a change on one side of the interface shall require a corresponding change to the other. After the review of Interface Management Plan by Engineer, the Contractor shall execute the Works in accordance with the plan.
 - 2) The Contractor shall fully coordinate 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.
 - 3) Once the Interface Management Plan has been reviewed by the Engineer and the Contractor, the Contractor shall develop and submit to the Engineer for review a detailed interface document for each other contractor that is mutually acceptable to all interfacing contractors. The detailed interface document shall address in detail how the dates identified in the Interface Management Plan shall be achieved and shall identify the data required by the interfacing designated contractors to meet the contractual requirements.
 - 4) The interface requirements shall form the basis of the detailed interface document, but does not relieve the Contractor's obligation to identify any new interface to meet the Contract requirements. Any revision to the detailed interface document shall be mutually acceptable by the contractors on all sides and submitted to the Engineer for
-

review.

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.

20.12 SYSTEM INTEGRATION PLAN

The Contractor shall provide a System Integration Plan for review by the Engineer. The System Integration Plan shall describe all the activities relating to.

The preparation and validation of the detail interface requirement specifications with each of the interfacing contractors during the design stage.

The delivery of the interfaces with each of the interfacing contractors according to the agreed detail interface requirement specifications.

Validation of the delivered interfaces through the detail interface test plans.

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 requirements | Detailed description of the personnel, tools, logistics that 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 | Task Allocation Table (TAT) shall be included in this section |
| 3.3 | Areas of concern | Process for managing the interface concerns |
| 4 | Process Management | |
| 4.1 | Change of interface requirements | The process for the management of interface requirement change shall 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 Attention | The criteria and methodology on requesting for the Employer’s attention shall be mentioned here. |

20.13 CLARIFICATION OF DESIGN, SUPPLY AND FIXING OF ITEMS

The Contractor must adhere to the requirements under Appendix B of this General Requirements.

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**Appendix C - Table describing specifications shall be coordinated for through operation
(for reference)**

**Appendix D - Table describing detailed technical specifications shall be coordinated for
through-operation (for reference)**

Appendix E - Document Submission and Response Procedure

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APPENDIX A - DEFINITIONS AND ABBREVIATIONS

This section defines the terms used in this General Requirements and, Technical Requirements for Rolling Stock.

Table A.1 Definitions

| Definition | Original terms |
|------------------------------------|---|
| Applicable Laws | The governing laws and regulations in force in the Philippines. |
| As-Built Drawings | Drawings produced by the Contractor and endorsed by the Engineer as true records of the construction of the Permanent Works and which have been agreed with the Engineer, if the Employer’s Design is changed during the course of the Works, the As-built Drawings shall be prepared by the Contractor and endorsed by the Engineer. |
| ATO Operation | Train operated under ATO. |
| ATP Mode (Train Operation) | The mode of train operation when train speed is controlled manually but is supervised by the primary ATP system to ensure safety speed limits are not exceeded |
| Combined Services Drawings | Drawings showing the locations, layouts and sizes of all services including those of the Contractor, and the interfaces with Interface contractors, so as to eliminate all clashes. |
| Commencement Date | The date specified in the Contract, or by some other arrangement with the Employer, upon which operations and activities required for the execution of the Works are to commence. |
| Commissioning | The process of setting to work relevant electrical and mechanical elements of the building services or complete transportation system through a series of integrated tests that demonstrate the installation and performance in accordance with the specified criteria. |
| Consist | Any collection of cars, serviceable and operable, of minimum 2 vehicle length and maximum 8-vehicle length with a cab at each end |
| Consumables | those parts that are not repairable and usually have a relatively short life span. |
| Contract Completion Date | the date specified in the Contract upon which the Works are to be completed and handed over to the Employer. |
| Defects Notification Period | Period for notifying Defects in the works calculated from the date on which the works completed as certified by taking over certificate. |
| Detailed Works Program | The Contractor’s Works program, showing the sequence, design, manufacture, delivery to the site, erection, construction, installation, testing, commissioning of the works and related activities in the form and content prescribed by the specification, or any amended or varied version thereof, as submitted by the Contractor and approved by the Engineer in accordance with the Contract. |
| Disadvantaged Persons | Passengers who are physically handicapped or have physical difficulty. These shall include senior citizens, the blind, people in wheelchairs, pregnant woman, and the like. |

| Definition | Original terms |
|---|--|
| Dwell Time | The elapsed time from when a train stops alongside a platform until it starts again. |
| Execution of the Works | The manufacture, supply, transportation, delivery to the 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. |
| External Interfacing Parties | Those parties with whom it is the Contractor’s responsibility to coordinate the Works with and includes all relevant bodies and entities, in particular Government authorities, departments and regulatory bodies, utility companies, property developers, consultants, and contractors of adjacent projects (other than MMSP), whether ongoing or planned. The Contractor shall identify all such interfacing parties in the Interface Management Plan (IMP). |
| Interface Contractors | The contractors, other than the Contractor, engaged by the Employer, who are undertaking works on the other MMSP contract packages. The Contractor shall identify all such interface contractors in the interface management plan. |
| LGU | A Local Government Unit, which refers to the local council or administrative body for a geographical area. |
| Main Line | All tracks over which trains carry fare paying passengers, including all berths, plus sidings and connections between, up to the limits leading into a yard. |
| Manual Operation | Train operated by operator under one of the following modes: ATP, ROS, RM or ATP Cut-out modes. |
| MCRP Project | Malolos-Clark Railway Project, which is the entirety of the project for which the Works shall construct. |
| MMSP Project | Metro Manila Subway Project, which is the entirety of the project for which this specification applies and which the Works shall construct. |
| NSRP-S Project | North South Railway Project-South Line, which is the entirety of the project for which the Works shall construct. |
| NSTren | General Consultant for NSCR Project. |
| Operational Mean Time to Restore (OMTTR) | Is defined as the average time to restore/normalize Rolling Stock with a fault on the main line |
| Spare Parts | Those parts which are generally repairable and normally have a service life of several years. |

| Definition | Original terms |
|--------------------|---|
| Taking Over | The point where the Works or any part thereof has passed all relevant tests and can be Taken-Over by the Employer in accordance with the GC and PC, notwithstanding the Works may have certain outstanding minor works to be completed, but nonetheless such shall not affect the Employer’s beneficial use of the Works or part as intended by the Contract. |

This section lists out all the abbreviations used in the ERG and ERT.

Table A.2 Abbreviations

| Abbreviation | Original terms |
|-----------------|---|
| µsec | Micro Second |
| °C | Degree Celsius |
| | |
| A or Amp | Ampere |
| ABS | Anti-lock Braking System |
| AC or ac | Alternate Current |
| ACU | Air-Conditioning Unit |
| AIDS | Acquired Immune Deficiency Syndrome |
| ANSI | American National Standards Institute |
| APSE | Auxiliary Power Supply Equipment |
| ASHRAE | The American Society of Heating, Refrigerating and Air-Conditioning Engineers |
| ATC | Automatic Train Control |
| ATO | Automatic Train Operation |
| ATP | Automatic Train Protection |
| AUGT | Automatic Urban Guided Transport |
| | |
| BCU | Brake Control Unit |
| BDS | Bid Data Sheet |
| BF | Bidding Forms |
| BFP | Bureau of Fire Protection |
| BOQ | Bill of Quantities |
| BS | British Standards |
| | |
| CAD | Computer Aided Design |
| CAR | Corrective Action Request |
| CBT | Computer-Based Training |
| CBTC | Communications Based Train Control |
| CCTV | Closed Circuit Television |
| CEMS | Crash Energy Management System |
| CENELEC | European Committee for Electro Technical Standardization |
| CF | Contract Forms |
| CMTTR | Corrective Mean Time To Repair |
| CPM | Critical Path Method |
| CSM | Common Safety Method |

| Abbreviation | Original terms |
|---------------------|---|
| Days | Calendar days including all weekends |
| dB (A) | Decibel, A-weighted |
| DC or dc | Direct Current |
| DID | Detail Interface Design |
| DIIT | Dynamic Integrated Interface Test |
| DOLE | The Philippines' Department of Labor and Employment |
| DOTr | Department of Transportation |
| DNP | Defects Notification Period |
| DPWH | Republic of the Philippines Department of Public Works and Highways |
| | |
| ED | End Device |
| EDMS | Electronic Document Management System |
| E&M | Electrical & Mechanical |
| EMC | Electro-Magnetic Compatibility |
| EMI | Electro Magnetic Interference |
| EMP | Environmental Management Plan |
| EN | European Norm |
| EQC | Evaluation and Qualification Criteria |
| ER | Employer’s Requirements |
| ERG | General Requirements |
| ESC | Eligible Source Countries of Japanese ODA Loans |
| ETCS | European Train Control System |
| ETFE | Ethylene Tetrafluoroethylene Fluoropolymer |
| | |
| FACI | First Article Configuration Inspection |
| FAT | Factory Acceptance Tests |
| FEM | Finite Element Model |
| FFR | Fault Free Run |
| FIS | Fault Indication System |
| FMI | Field Modification Instruction |
| | |
| GCC | General Conditions of Contract |
| GSM(R) | Global System for Mobile Communications (Railway) |
| | |
| HIV | Human Immunodeficiency Virus |
| HMI | Human Machine Interface |
| HSCB | High Speed Circuit Breaker |
| HV | High Voltage |
| Hz | Hertz |
| | |
| IEC | International Electromechanical Commission |
| IFAT | Integrated Factory Acceptance Test |
| IFBT | Integrated Factory Bench Test |
| IGBT | Insulated Gate Bipolar Transistor |
| IMP | Interface Management Plan |
| IP | Ingress Protection |
| IPC | Illustrated Parts Catalogs |

| Abbreviation | Original terms |
|------------------------|---|
| ISO | International Organization for Standardization |
| ITB | Instructions to Bidders |
| ITCP | Inspection, Testing and Commissioning Plan |
| ITU | International Telecommunication Union |
| ITU-R | ITU Radio Communication Sector |
| ITU-T | ITU Telecommunication Standardization Sector |
| | |
| JICA | Japanese International Cooperation Agency |
| JRIS | Rolling Stock Industrial Standard |
| | |
| kg | Kilogram |
| km | Kilometer |
| km/h | Kilometers per hour |
| kN | Kilonewton |
| kV | Kilovolt |
| kW | Kilowatt |
| | |
| LB | Line Breaker |
| LGUs | Local Government Units |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| LLRU | Lowest Line Replaceable Units |
| LTE(4G) | Long-Term Evolution (Fourth Generation) |
| LVPS | Low Voltage Power Supply |
| | |
| m² | Square meter |
| m/s² | Meters per square second |
| m/s³ | Meters per cubic second |
| MDBF | Mean Distance Between Failure |
| MLIT | Ministry of Land, Infrastructure, Transport and Tourism |
| mm | Millimeter |
| MMDA | Metro Manila Development Authority |
| MMS | Maintenace Management System |
| MPa | Megapascal (Pressure Unit) |
| MSDS | Material Safety Data Sheet |
| ms | Milisecond |
| MWI | Maintenance Work Instruction |
| MERALCO | Manila Electric Co. |
| | |
| N | Newton |
| NAIA | Ninoy Aquino International Airport |
| NDT | Non Destructive Tests |
| NGOs | Non-Government Organizations |
| NSCR | North-South Commuter Railway |
| NTC | National Telecommunications Commission |
| NTO | Non-automated Train Operation |

| Abbreviation | Original terms |
|---------------------|---|
| NONO | Notice of No Objection |
| NONOC | Notice of No Objection with Comments |
| NOR | Notice of Rejection+ |
| | |
| O&M | Operation and Maintenance |
| OCC | Operation’s Control Center |
| OCS | Overhead Catenary System |
| ODA | Official Development Assistance |
| OEM | Original Equipment Manufacturer |
| OH&S | Occupational Health and Safety |
| OMTTR | Operation Mean Time To Restore |
| OS | Operating System |
| | |
| PA | Public Address |
| PAC | Performance Acceptance Criteria |
| PAGASA | Philippine Atmospheric, Geophysical and Astronomical Services |
| PAP | Performance Assurance Plan |
| PCC | Particular Condition of Contract |
| PDM | Precedence Diagram Method |
| PCE | Power Conversion Equipment |
| PEC | Philippine Electrical Code |
| PECE | Power Electronics Control Equipment |
| PEI | Passenger Emergency Intercom |
| PERT | Program Evaluation and Review Technique |
| PID | Platform Information Display |
| PLC | Programmable Logic Processor |
| PID | Passenger Information Display |
| PMP | Project Management Plan |
| PNR | Philippine National Railways |
| PNS | Philippine National Standards |
| PPE | Personal Protective Equipment |
| PR | Public Relation |
| PSD | Platform Screen Door |
| PTT | Press to Talk switch |
| PTU | Portable Test Unit |
| PRI | Philippine Railway Institute |
| | |
| QMP | Quality Management Plan |
| | |
| RFI | Request For Information |
| RFI | Radio Frequency Interference |
| RM | Restricted Manual |
| ROS | Running On Sight |
| RS | Rolling Stock |
| | |
| SAMP | System Assurance Management Plan |

| Abbreviation | Original terms |
|---------------------|--|
| SAP | Systems Assurance Plan |
| SAT | Site Acceptance Test |
| SBD | Safe Braking Distance |
| SHE | Safety, Health and Environment |
| SI | Le Système International d'Unités (International System of Unit s) |
| SIFIT | Static Integrated Factory Interface Test |
| SIT | System Integration Tests |
| SMP | Site Management Plan |
| SOW | Scope of Works |
| SSAMP | System Safety Assurance Management Plan |
| SSMP | Site Safety Management Plan |
| STI | Speech Transmission Index |
| STO | Semi-automatic Train Operation |
| SUV | Sport Utility Vehicle |
| | |
| t | Ton |
| T&C | Testing and Commissioning |
| TCN | Train Communication Network |
| TFE | Tetrafluoroethylene |
| TMS | Train Management System |
| TOC | Taking Over Certification |
| TOCP | Train Operator Control Panel |
| ERT | Technical Requirements |
| | |
| UIC | International Union of Railway Standards |
| UL | Underwriters’ Laboratories |
| UPS | Uninterruptible Power Supply |
| UV | Ultra Violet (Light Spectrum 400 Nm to 100 Nm) |
| | |
| V&V | Verification and Validation |
| V ac | Voltage alternative current |
| V dc | Voltage direct current |
| VAC | Ventilation and Air-Conditioning |
| VDT | Visual Display Terminals |
| Vnom | Nominal Voltage |
| Vpk | Peak Voltage |
| VS | Vehicle Switch |
| VVP | Verification and Validation Plan |
| VVVF | Variable Voltage Variable Frequency |
| V-LAN | Virtual LAN |
| | |
| W0 | Vehicle Tare Weight |
| W1 | W0 + Seated Passenger |
| W2 | W1 + 4 passenger/meter standee |
| W3 | W1 + 7 passenger / meter standee |
| W4 | W3 + dynamic load and safety margin |

| Abbreviation | Original terms |
|---------------------|--------------------------|
| WBS | Work Breakdown Structure |
| XLPO | Cross-linked polyolefin |

APPENDIX B - SPLIT RESPONSIBILITY ON ROLLING STOCK AND OTHER WORKS

1. Clarification of Design, Supply and Fix Items.

The Contractor shall prepare the detailed interface document in order to coordinate with the interface contractors in the construction/installation works as mentioned in the ERG and ERT. The Contractor shall include, but not be limited, to the following design requirement, design, supply and fix items.

The Contract Package shall be stated as follow:

- 1) CP107: Rolling Stock for MMSP;
- 2) CP106: E&M System and Track Works for MMSP;
- 3) CP NS-01: E&M System and Track Works for MCRP/NSRP-S;
- 4) CP101 partial operation section civil work and DEPOT for MMSP; and
- 5) CP102,103,104,105,106,107 and 108 Civil work for MMSP

Table B.1 Interface Responsibility Matrix

| No. | Interface Item | Design Requirement | Design, Size & Location | Supply | Fix | Remarks |
|-----|--|--------------------|-------------------------|--------|-------|---|
| 1-a | Description of on-board Signaling & Communication Equipment’s but not limited to the following: 1) On-board signaling system racks/cubicles 2) Wheel sensors SIG 3) Accelerometer SIG 4) Radar SIG 5) Antenna SIG 6) On boards data communication System (DCS) for CBTC 7) Driver Machine Interface SIG 8) Cables for interlink with signaling equipment 9) Cable connectors for signaling equipment 10) Train Radio- com 11) Antenna- com 12) Antenna cable - com 13) Connectors for communication equipment | CP106 | CP107 and CP106 | CP106 | CP107 | CP107 and CP106 Contractors shall coordinate and agree on the size, space and location. |

| No. | Interface Item | Design Requirement | Design, Size & Location | Supply | Fix | Remarks |
|-----|---|--------------------|-------------------------|----------|-------|---|
| 1-b | Description of on-board Signaling & Communication Equipment’s but not limited to the following: 1) On-board signaling system racks/cubicles 2) Wheel sensors SIG 3) Accelerometer SIG 4) Radar SIG 5) Antenna SIG 6) On boards data communication System (DCS) for ETCS-Level2 7) Driver Machine Interface SIG 8) Cables for interlink with signaling equipment 9) Cable connectors for signaling equipment 10) Train Radio- com 11) Antenna- com 12) Antenna cable - com Connectors for communication equipment | CP NS-01 | CP107 and CP NS-01 | CP NS-01 | CP107 | CP107 and CP NS-01 Contractors shall coordinate and agree on the size, space and location. |
| 2 | Equipment for Running and Stopping Assistant System | CP NS-01 | CP107 and CP NS-01 | CP NS-01 | CP107 | CP107 and CP NS-01 Contractors shall coordinate and agree on the size, space and location. |
| 3 | Equipment for PSD Controller | CP NS-01 | CP107 and CP NS-01 | CP NS-01 | CP107 | CP107 and CP NS-01 Contractors shall coordinate and agree on the size, space and location. |

| No. | Interface Item | Design Requirement | Design, Size & Location | Supply | Fix | Remarks |
|-----|---|--------------------|-----------------------------------|-------------------|-------|--|
| 4 | Cable description but not limited to the following: 1) Power supply cable for train radio 2) Power supply cable for Signaling & Communication equipment 3) Cables for train lines to signaling equipment 4) Power supply cable for Advertising Equipment. | CP106 CP NS-01 | CP107 CP106 and CP NS-01 | CP107 | CP107 | CP107, CP106 and CP NS-01 Contractors shall coordinate and agree on the size and location |
| 5 | Fixtures and Fittings: Disconnection and terminal blocks, device mounting brackets and plates, flexible conduit assemblies complete with connectors and cables from speed measurement devices to the junction boxes. | CP106 CP NS-01 | CP107 CP106 and CP NS-01 | CP106 CP NS-01 | CP107 | CP107, CP106 and CP NS-01 Contractors shall coordinate and agree on the size and location |
| 6 | Power Supply and Earthing Arrangements: Power supply circuits, including positive and negative poles, for the on-board signaling equipment. Dedicated earthing arrangements for the on-board signaling equipment | CP106 CP NS-01 | CP107 CP106 and CP NS-01 | CP107 | CP107 | |

| No. | Interface Item | Design Requirement | Design, Size & Location | Supply | Fix | Remarks |
|-----|---|--------------------|-------------------------|--------|-------|---|
| 7 | Overhead Catenary System (OCS): OCS height, staggering, sag and other required parameters with reference to the Rolling Stock supplied pantograph. | CP107 and CP106 | CP106 | CP106 | CP106 | CP107 and CP106 Contractors shall coordinate and agree on the OCS height, staggering, sag and other required parameters with reference to the Rolling Stock supplied pantograph. |
| 8 | Maintenance Management System (MMS) consisting of software and hardware for the planning and management of all maintenance work and associated function, including but not limited to following: Assets management, Material Management, Maintenance Schedule, work order, Maintenance Record, failure log etc. | CP107 and CP106 | CP106 | CP106 | CP106 | CP107 and CP106 Contractors shall coordinate and agree for the MMS requirements and CP107 shall provide all the necessary required data for MMS. |
| 9 | Voltage Drop in Traction System and Rectifier Capacity | CP107 and CP106 | CP106 | CP106 | CP106 | CP107 and CP106 Contractors shall coordinate and exchange |
| 10 | The CP107 shall provide six (6) units of couplers and deliver to the CP106 Contractor | - | - | CP107 | CP106 | CP107 & CP106 Contractors shall coordinate and exchange the information for schedule of delivery, location and other related requirements (if any). |

| No. | Interface Item | Design Requirement | Design, Size & Location | Supply | Fix | Remarks |
|-----|--|--------------------|--------------------------|----------|----------|---------|
| 11 | Interface with track works of NSRP-S | CP NS-01 | CP NS-01 And CP107 | CP NS-01 | CP NS-01 | |
| 12 | Interface with NSCR-N2 & SC rolling stock for train coupling and recovery. | CP03 CP NS-02 | CP107 | CP107 | CP107 | |

Please note that design requirement mentioned above are not exhaustive, Contractor shall further elaborate the requirements in close coordination with interface Contractors. Associated interfaces work not mentioned in the above table 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 shall 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.

Table B.2: Split Responsibility in Special Tools for Rolling Stock and Depot Equipment

| ITEM | DESCRIPTION | SUPPLY |
|----------|---|--------|
| 1 | Workshop Facilities | |
| 1.1 | Turn table for bogie | CP101 |
| 1.2 | Lifting jack for car body | CP101 |
| 2 | Testing Equipment | |
| 2.1 | Portable test unit for traction controller (with software) | CP107 |
| 2.2 | Portable test unit for auxiliary power supply equipment (with software) | CP107 |
| 2.3 | Portable test unit for air conditioning unit (with software) | CP107 |
| 2.4 | Portable test unit for brake control unit (with software) | CP107 |
| 2.5 | Portable test unit for TMS (with software) | CP107 |
| 2.6 | Test equipment for ACU | CP107 |
| 2.7 | Test equipment for brake control unit | CP107 |
| 2.8 | Testing equipment for relays | CP107 |
| 2.9 | Testing equipment for magnetic valves | CP107 |
| 3 | Jigs/Test Stands | |
| 3.1 | Test stands for bogie | CP107 |
| 3.2 | Lifting jig for ACU | CP107 |
| 3.3 | Test stand for ACU | CP107 |
| 4 | Machining Tools | |
| 4.1 | Wheel re-profiling machine | CP101 |
| 4.2 | Wheel lathe | CP101 |
| 5 | Tools For Maintenance Work | |
| 5.1 | Refrigerant retainer | CP101 |
| 5.2 | Not used. | - |
| 5.3 | Window glass lifting fixture (vacuum) | CP101 |
| 5.4 | Crimping tool for electric connector (for each equipment) | CP101 |
| 5.5 | Wrenches | CP101 |
| 5.6 | Power supply for testing electrical equipment | CP101 |
| 5.7 | Welding machine | CP101 |
| 5.8 | Soldering iron | CP101 |
| 6 | Cleaning Facilities | |
| 6.1 | Train washing plant | CP101 |
| 6.2 | Parts washer | CP101 |
| 7 | Measuring Tools | |
| 7.1 | Digital multi-meter | CP101 |
| 7.2 | Ohmmeter | CP101 |
| 7.3 | Wheel diameter measuring equipment | CP107 |
| 7.4 | Back gauge measuring equipment | CP107 |
| 7.5 | Wheel profile gauge | CP107 |
| 7.6 | Coupler head wear gauge | CP107 |
| 7.7 | Leak detector for refrigerant | CP107 |
| 7.8 | Tension gauge for measuring upward force of pantograph | CP107 |
| 7.9 | Vacuum pump for refrigerant | CP101 |
| 8 | Transportation Equipment | |
| 8.1 | Shunting vehicle | CP101 |
| 8.2 | Truck for transporting air conditioning unit | CP107 |

APPENDIX C - TABLE DESCRIBING SPECIFICATIONS SHALL BE COORDINATED FOR THROUGH-OPERATION (FOR REFERENCE)

| Items | Main Contents | Remarks |
|---|--|--|
| Standard Specification about Through-Operation (Refer to another paper) | <p>Major Items about Specifications of Rolling Stock showed below but not limited to: Rolling Stock Gauge, Train Formation, Passenger Capacity, Train Performance, Size, Weight, Details of Doors(position, numbers etc.), Signaling System, Radio System, Mounted Equipment, Arrangement of Equipment relating to Operation, etc.</p> | Basic specifications to achieve through-operation. This article outlines specifications for through-operations. |
| Agreed Items (Refer to another paper) | <p>Details of Specifications mentioned above, examples showed below; Details of Acceleration and Deceleration, Idle Running Time, Wheel Profile, Arrangement and System of Equipment Operated by Crews, Details of Signaling System, Details of Radio System, Position of On-board antennas, Passenger Emergency Intercom, Cocks of Various Equipment, Keys, Lightings, Horns, Couplers, Electrical Connecting Cables and Plugs for Relief Operation, Driver’s Vigilance System, Speed Meter, Indicators of Driver’s Console, Indicators for faults, Various Gauges, Buzzers and Bells, Structure of Cab, Indicators of Destination and Service Type and Service numbers, Fire Distinguisher, Emergency tools, Derails of Emergency Operations, Details of Pantographs, Prevention of Coasting, etc.</p> | Detailed Specifications to reduce operation load of crews and probability of human errors for achievement of smooth through-operation. |
| Compatibility with Grand Equipment (Refer to another paper) | <p>Rolling Stock Gauge, Compatibility with rail, Compatibility with Grand Electrical Equipment, Compatibility with Platform, Compatibility with PSD, Signaling System, Radio System, Stop Accuracy for ATO, Structure of Rolling Stock, Countermeasure for Fire of Rolling Stock, Specifications for One-Man Operation, etc.</p> | Necessary Specifications to comply with grand equipment of other lines as through-operation. |
| Standards Relating to Barrier Free (Refer to another paper) | <p>Passenger Doors, Structure of Saloons, Indicators, Details of Steps, etc.</p> | Necessary Specifications to comply with standards relating to barrier free of other lines as through-operation. |

**APPENDIX D - TABLE DESCRIBING DETAILED TECHNICAL SPECIFICATIONS
 SHALL BE COORDINATED FOR THROUGH-OPERATION (FOR REFERENCE)**

| Items | Main Contents | Remarks |
|---|---|---|
| Performance of Acceleration and Deceleration | Traction performance (torque vs. train speed) shall be complied with requirements of each lines. Though It is acceptable to be differed Regenerative performance between each vehicles, difference of energy saving performance shall be recognized. | It is necessary to satisfy requirements of each lines. Each run curves including ATO recovery patterns shall be submitted to each other. |
| Detail Specifications | Following specifications, but not limited to, shall be in conjunction with Rolling Stocks of other lines as through-operation. Position of Coupler, Details of Connecting Cables and Plugs for Relief Operation, Telegrams for PSD control, Position of On-board antennas, | Technical specifications shall be needed for detailed design. |
| Details of Equipment in the cabs and Arrangement of these | Details and Arrangement of following Equipment shall be coordinated with each lines. Master Controller, Keys, ATP Cut Out Switch, Contents displayed to TCMS monitor, Contents displayed to CBTC monitor, Various Indicators, ATP mode change Switch, Various Circuit Breakers, etc. | Detailed specifications, relating to operation, which shall be coordinated to ease operations. |
| Specifications Relating to Abnormal Situations | Design policy relating to redundancy and operations for abnormal situations and so on, about equipment showed below, shall be coordinated with each lines. Propulsion system, APS, Brake System, Door System, Signaling System, PSD System, etc. | Coordination about these contents are necessary for smooth through-operation, even if abnormal situations happen. Also educations for operators are likely to become longer when these contents are different. |

APPENDIX E

DOCUMENT SUBMISSION AND RESPONSE PROCEDURE

1. SUBMISSIONS TO THE ENGINEER

The general requirements for the procedure of the Contractor’s documents submission to the Engineer are as follows.

1.1 PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)

- 1) The Contractor shall provide a web-bases information management system of transmittal of formal project correspondence, documents and information to ensure efficient information management on the Project. Where it is necessary to transmit original-signed documents, these shall be acceptable forms of correspondence only when they have been issued via the system first.
- 2) The Contractor shall provide the Project-wide use of the system during the design and construction phases and also the Defects Notification Periods.
- 3) The Contractor shall prepare, upload and submit all correspondences and submissions (drawings, statements, photos, etc.) using the PMIS in an approved format such as Microsoft® Excel, Microsoft® Word, JPEG, Primavera®, Aconex®, Bentley Microsoft® and Adobe® Acrobat.
- 4) Access by Project Team Members

Access by the “Project Team Members” to the PMIS shall be provided via a digital user ID and password from remote locations at any time, eliminating the problems that occur in liner communication schemes.

The Project Team Members are information managers and the designated experts of the Employer, the Engineer, the Contractor, and the Sub-Contractor. These members shall be allowed to insert, search, view, print, update, delete information, with the use of a web browser.

Other Project participants shall be allowed only to search and review information, with the use of a web browser.

5a) PMIS Functions

- Track and report on who entered the system.
- Track and report on what searches have been made.
- Track and report on what documents have been seen.
- Track and report on what comments or changes have been made.
- Provide ability for users to send messages to other users.
- Allow users to subscribe for e-mail alerts for updates, submissions, or any other changes.

5b) PMIS Features

- Introduction of a project hierarchy into the system.
- A web-based interface for the submission of construction data.
- Utilization of security measures to ensure confidentiality of data, such as SSL (https) protocols, encryption of transmitted data, user accounts/passwords for access to PMIS, etc.
- Appropriate routine automated backups to ensure protection of all data and system files. Backups must be able to recover and/or rollback the entire PMIS and all data in the event of hardware/software failures, malicious attacks on the system, or a loss of the hosting facilities or sites.

6a) Options of PMIS Implementation

- Develop a customized PMIS in-house,
- Develop a PMIS by purchasing commercial web-enabled software and customizing the software, or
- Rent, lease, or purchase a license for a developed PMIS.

6b) Options of PMIS Hosting

The aforementioned PMIS software implementation may be hosted on:

- The Contractor’s internal server(s), or
- A 3rd party hosting service.

For all options above, appropriate bandwidth, processing power, and storage must be provided to meet the needs of the PMIS. The Contractor shall be responsible for installing the PMIS software and any supporting software and for ensuring that the system is operating properly.

- 7) The Contractor shall provide initial users training for implementation of the system.
- 8) The Contractor shall provide and manage server and data back-up for the PMIS. In the event of complete system failure, the Contractor shall restore the system within 2 weeks using back-up data from the day prior to the failure.

1.2 DRAWING REGISTER

The Contractor shall submit a drawing register to the Engineer in electronic soft and hard copies along with each submission of drawings and at an interval agreed with the Engineer. The drawing register shall be in a format reviewed and agreed to by the Engineer and shall include each document reference number, version, date, title and data-file name.

2. RECORDS AND REPORTS

2.1 FORMAT

Reports and records are to be submitted, via the PMIS, to the Engineer and shall be in a format agreed to by the Engineer. Reports and records shall be signed prior to submission by the Contractor’s Representative or by the relevant agents duly authorized by the Contractor’s Representative.

2.2 PROJECT DOCUMENT CONTROL PROCEDURE

Within twenty-eight (28) days after the Commencement Date, the Contractor shall submit, via the PMIS, to the Engineer for review, a proposed document control procedure including but not 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:
 - a) contract number;
 - b) discipline;
 - c) submission reference number; and
 - d) revision indicator.

2.3 PROJECT RECORDS

Project records will eventually be used by the Employer to manage, operate and maintain the Works after the completion of the Project and for future reference.

2.4 ADEQUACY OF THE PROJECT RECORDS

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 records.

3. SUBMISSION AND RESPONSE PROCEDURE

3.1 GENERAL

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.

3.2 PROPOSALS

Each submission shall be accompanied by a brief introduction to explain the sub-system, part or section of the Works to which the submission refers, listing the documents enclosed with the submission, and briefly describing how all relevant requirements of the Employer’s Requirements are achieved by the proposal.

3.3 SUBMISSION RESPONSE REQUEST

For each stage of submittal, the Contractor shall prepare a Submission Response Request (SRR) carrying the date of submission, the submission reference number as defined in Clause 2.2 (4) above, the submission title, the stage of submission (e.g. Technical Design, etc.), and the authorised signature of the Contractor’s Representative or the responsible engineer authorized by him to confirm that, in the opinion of the Contractor, the submission:

- 1) complies with all relevant requirements of the Employer’s 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, where required, such approvals have been granted.

3.4 THE ENGINEER’S RESPONSE

The Engineer’s response to the submission will be made within 28 calendar days of receipt of the submission; however, the Engineer will endeavour to respond within 21 days, provided that the submission is made no later than the date shown on the Design Submissions Programme. The Engineer may extend the review period reasonably depending on the amount of documentation accompanying the submission.

3.5 MONTHLY DESIGN REVIEW MEETINGS

Throughout the design stage, the Contractor shall attend monthly design review meetings with the Engineer. At these Engineer’s review meetings, the Contractor shall present information, drawings and other documents to the Engineer in respect of all submissions programmed to occur during the following five-week period. The Contractor’s presentations shall be in sufficient depth to enable the Engineer to obtain a clear understanding of the Contractor’s proposals and to discuss the methodology and process used in reaching the proposed design solutions.

3.6 THE ENGINEER’S OBSERVATIONS

The Contractor shall record all of the Engineer’s observations and any agreed actions resulting from the Engineer’s review meeting and shall address each of these fully before submission of the respective documents for formal review.

3.7 NOTIFICATION

If, in the Engineer’s opinion, following receipt of a submission there is benefit to be gained from a meeting with the Contractor to clarify or discuss any of the contents of the submission, he will notify the Contractor accordingly with not less than 5 days advance notice, and the Contractor shall attend at the time and place appointed by the Engineer.

3.8 NOTICE OF NO OBJECTION

The Contractor in respect of the Works or any sub-system, part or section may make no submission thereof unless a Notice of No Objection or a Notice of No Objection with Comments has been received for the previous stage of the same Works or any sub-system, part or section thereof.

4. THE ENGINEER’S RESPONSE PROCEDURES

4.1 RESPONSE PROCEDURES

The Engineer will respond in one of the following three ways:

- 1) “Notice of Rejection” (with “A” Comments)
- 2) “Notice of No Objection”, and
- 3) “Notice of No Objection with Comments” (with “B” or/and “C” Comments)

4.2 RESPONSE DEFINITION

Definition of the Engineer’s response:

- 1) “Notice of Rejection” (with “A” Comments): if, following his review of the submission, the Engineer discovers major non-compliance, discrepancies or omissions, etc. that in his opinion are of a critical nature, the Engineer will issue a “Notice of Rejection” (NOR) with type “A” comments. The Contractor shall revise and reissue the submission addressing the Engineer’s comments. Following the issue of a NOR by the Engineer the Contractor is not entitled to proceed to the next programmed stage for that section of the Works until all of the Engineer’s comments have been fully addressed and a “Notice of No Objection (NONO)” issued.
- 2) “Notice of No Objection”: if, following his review of the submission, the Engineer has not discovered any non-compliance with the Contract, the Engineer will issue to the Contractor a formal NONO. A NONO from the Engineer irrespective of with or without comments does not in any way imply the Engineer’s consent of the submission nor does it remove any responsibility from the Contractor for complying with the Contract. Issue of a NONO from the Engineer entitles the Contractor to proceed to the next stage of the programmed work.
- 3) “Notice of No Objection” (With Comments): if, following his review of the submission, the Engineer discovers discrepancies or omissions, etc. that in his opinion are not of a critical nature, the Engineer may issue a “Notice of No Objection” with Comments, (NONOC). The comments will be of either type B or type C as defined below. The Contractor shall respond to the comments in accordance with the requirements of Clause 4.3 below. Following the issue of a NONOC by the Engineer, the Contractor is entitled to proceed to the next stage of the programmed work subject to the inclusion of amendments necessary to address the comments.

The Contractor shall respond to Type B and C comments and get the Engineer’s agreement and closure prior to full inclusion of amendments in the Final Design.

4.3 THE ENGINEER’S COMMENTS

Definition of the Engineer’s comments is as follows:

- 1) Type “A” Comments are of a critical nature that renders the submission non-compliant with the Contract, and the submission shall be corrected and resubmitted.
- 2) Type “B” Comments are of an intermediate nature that shall be responded, agreed and incorporated prior to inclusion in the “Construction Pack”.
- 3) Type “C” Comments are of a minor nature or may affect future submissions.

5. STORAGE AND ARCHIVE OF DOCUMENTS

The Contractor shall establish and maintain a place for the storage and archiving of all the documents which are relating to the Works but are not required to be submitted to the Engineer under Clause 2 herein.