Annexure 1.1:

General Technical Requirements

Signalling

Contents

1 GENERAL

1.1 Purpose of the Document

1.1.1 The purpose of this document is to provide the General Technical Requirements ("GTR") which form part of the minimum Requirements of the Passenger Rail Agency of South Africa ("PRASA") for the enablement of the PRASA Train Control System ("PTCS") Phase 1 through the restoration, verification, testing, and commissioning of the existing original equipment manufacturer ("OEM") Electronic Signalling Interlocking System in PRASA's Western Cape ("WC") service region ("the Project") that the Bidder shall meet and deliver at the Bidder's cost therefore within the Bid Price.

1.2 Executive Overview

1.2.1 Notwithstanding any other PRASA Requirements stated throughout the RFP, the Bidder shall uncompromisingly deliver the whole of the Works required to achieve successful delivery of the Project.

1.2.2 The Signalling Component of the Works, in this Phase 1 of the enabling of the PRASA PTCS, is at a minimum, summarised as follows:

a) Restore previously installed original equipment manufacturer ("OEM") Interlocking System.

b) Restore all the previously installed associated lineside Signalling Equipment such as point machines, signals, Track Vacancy Detection ("TVD"), which complies with the PRASA requirements and specification.

c) Restore the signalling on all PRASA railway lines with the interlocking and wayside Equipment according to the design provided.

d) Provide all required resources to deliver the Signalling Works.

e) Any other Signalling Works, activities and resources required to restore and implement a fully, functional, complete original equipment manufacturer ("OEM") Interlocking System and associated sub-systems as requested throughout the RFP or as otherwise instructed in writing by PRASA.

2 MINIMUM SYSTEM REQUIREMENTS

2.1 Railway Signalling System ("RSS") Overview

2.1.1 The current RSS, at a minimum, consists of the following elements:

a) Electronic Interlocking System ("EI").

b) Multi-aspect line side Signalling with flashing aspects.

c) Track Vacancy Detection ("TVD").

d) Points Machines.

e) Power Supply System ("PSS").

f) Communication with and power to Lineside Equipment.

g) Level Crossing ("LX") Controllers.

2.1.2 The restored RSS shall, at a minimum, comply with all relevant Standards, Specifications, Regulations and Procedures as specified throughout the RFP.

2.1.3 The restored RSS shall be installed to have limited exposure to theft and vandalism and shall have no or very limited copper. Suitable copper-coated alluminium cables should be considered for installation pending PRASA approval (as per TFR specification ……).

2.1.4 The Bidder shall implement all necessary measures to protect the RSS, sub-Systems, and all Equipment against at least the following threats:

a) Theft and vandalism

b) Incoming high voltages, spikes, Electromagnetic Compatibility ("EMC") and fluctuating voltages

c) Intermittent flash flooding in low laying areas

d) Severe thunderstorms with extreme heavy lightning

2.1.5 The Bidder shall earth the RSS properly, complying with all Standards, Specifications, Regulations and Procedures in the Main Technical References ("MTR").

2.2 Electronic Interlocking System ("EI")

2.2.1 The Bidder shall restore the interlocking equipment at the Maitland AR to the same OEM technology that was validated and approved by PRASA for the Western Cape Re-Signalling project.

2.3 Multi-Aspect (Flashing Aspects) Lineside Signalling

2.3.1 The Bidder shall restore all damaged signals to the same design and functionality that was validated and approved by PRASA for the Western Cape Re-Signalling project (LED cluster-type light units)

2.3.2 The Bidder shall implement measures to protect the signals against at least the following threats, in-line with the guidelines in the MTR:

a) Theft/Vandalism of LED light units.

b) Theft/Vandalism of tail cables.

c) Pulling down/Cutting off signal post.

d) Damage to LED units and/or other Equipment by continues exposure to direct sunlight.

2.3.3 For all reinstated signals, the Bidder shall, at a minimum, implement the following measures to defer and delay any theft and vandalism attempts:

a) LED Signal unit housings and hoods which need to be replaced to be manufactured of material without any re-sale or repurpose value.

b) Signal lenses that need to be replaced need to be protected and able to withstand hard objects with hard impact.

c) Cable between the signal base and the concrete base (biscuit) to be protected.

d) Shortened suspended signal ladders to restrict unauthorised access.

e) Install enclosure unit as per design to protect cab tyre cable fly leads to the LED signal units.

2.4 Track Vacancy Detection (TVD")

2.4.1 The Bidder shall, where required, restore all damaged axle counters to the same design and functionality that was validated and approved by PRASA for the Western Cape Re-Signalling project OEM Axle Counters)

2.4.2 The Bidder shall implement measures to protect the reinstated AZs against at least the following threats, in-line with the guidelines in the MTR:

a) Theft/Vandalism of Track side EAKs and Train Detection point Equipment.

b) Theft/Vandalism of AZ cables.

c) Mechanical damage caused by parts of the running train reaching beyond the profile.

2.4.3 For all reinstated Axle Counters, the Bidder shall, at a minimum, implement the following measures to defer and delay any theft and vandalism attempts:

a) EAK Equipment to be installed in a re-enforced concrete silo with re-enforced concrete lid, buried and concreted to restrict unauthorised access, while allowing access for maintenance. The Bidder shall provide all required tools and Equipment to open and close the silos during maintenance.

b) Protection of Axle Counter Detection Heads by means of protective housing able to withstand hard objects with hard impact.

c) Cable connecting the Axle counter Head to the trackside Equipment to be:

- Buried as per attached Installation Method Statement, with access to track side Equipment from directly under the silo and access to head directly under railway track, through ballast
- Protected with Nextube or similar, with no visible or accessible cable between trackside equipment and head

2.5 Points Machines

2.5.1 The Bidder shall restore all damaged points machines to the same design and functionality that was validated and approved by PRASA for the Western Cape Re-Signalling project.

2.5.2 The Bidder shall restore all damaged cradles, rodding, drive, detection, Spherolock, tie-plate, number plate and relevant components to the same design and functionality that was validated and approved by PRASA for Western Cape Re-Signalling project.

2.5.3 The Bidder shall provide new concrete sleepers where necessary, and to allow for the tamping of such sleepers by qualified Perway personnel.

2.5.4 The Bidder shall implement all necessary measures to protect the points machines against at least the following additional specific threats, in-line with the guidelines in the MTR:

a) Theft/Vandalism of covers/lids.

b) Theft/Vandalism of tail cables.

c) Theft/Vandalism of point machine Equipment.

d) Points machines to be secured with vandal proof lid and locking mechanism

e) Complete points machine to be protected with a steel cage as per required design.

2.6 Power Supply Systems ("PSS")

2.6.1 The Bidder shall restore all existing power supply systems to the same design and functionality that was validated and approved by PRASA for the Western Cape Re-Signalling project where required as per the as-built design.

2.6.2 New UPS and Lithium batteries to be installed at selected SER's and AR's. Specifications to be provided for PRASA approval.

2.7 Communication with, and Power to, Lineside Equipment

2.7.1 The Bidder shall restore all fibre, signal, and power cables for the whole of the Works as per the approved cables plans.

2.7.2 Communication between Equipment Rooms over fully redundant Optic Fibre Cable ("OFC") to be replaced or restored as detailed in the PTR's. For details and specifications regarding the Optic Fibre Cable refer to Annexure1.2 GTR Telecommunications.

2.7.3 All cables shall comply with standard Railway Signalling specifications.

2.7.4 Cables shall not exceed 1km in length. The Bidder shall create an additional termination point where a cable length exceeds 1km between termination points.

2.7.5 The Bidder shall show cable joint and their GPS coordinates on the final As-Built cable plan and the number of joints per section of cable should be restricted to not more than two.

2.7.6 Cable route plans to be prepared and approved by PRASA for all areas where cables need to be restored.

2.7.7 The Bidder shall provide all resources, including qualified track masters, required for supervising cross trenching.

2.7.8 The Bidder shall implement measures to protect all cables and communication Equipment against at least the following additional specific threats, in-line with the guidelines in the MTR:

a) Theft/Vandalism

b) Damage due to veld fires.

c) Against accessibility and easy cable cut.

2.7.9 The Bidder shall, at a minimum, implement the following measures to defer and delay any theft and vandalism attempts:

a) Cables to be buried at 950mm with cables concreted in the middle of at least 300mm concrete at 30 MPa as per attached Installation Method Statement. Any depth variation to be approved by PRASA.

2.8 Level Crossing ("LX") Controllers

2.8.1 The Bidder shall restore damaged controlled level crossing installations as per the approved as-built designs for each level crossing where applicable.

3 ENGINEERING

3.1 Restoration And Installation

3.1.1 Restoration and Installation shall comply with all relevant Standards, Specifications, Regulations and Procedures as specified throughout the RFP.

3.1.2 The Bidder shall submit a detailed Quality Management Plan (“QMP”) for the Restoration and Installation process to PRASA for acceptance.

4 CONSTRUCTION

4.1 General

4.1.1 Signal Restoration and Installation work shall comply with all relevant Standards, Specifications, Regulations and Procedures as specified throughout the RFP.

4.1.2 Signal Restoration and Installation work shall only be performed by PRASA approved signal companies.

4.1.3 The Bidder shall submit Method Statements for all signal Restoration work to be performed to PRASA for review and approval before commencement of the work.

4.1.4 All Restoration work on or near the railway line shall be performed under Occupation-between-trains (“OBT”) or Total Occupation conditions.

4.1.5 The Bidder to perform all the Restoration work, except if expressly stated otherwise in the GTRs or PTRs.

4.1.6 The outdoor Installation shall cover all signal Works and enabling Electrical, Telecommunications and other Works.

4.1.7 The Bidder to apply for wayleave from relevant stakeholders and get all necessary approvals prior to commencement of construction.

5 TESTING AND COMMISSIONING

5.1 General

5.1.1 All Testing and Commissioning activities to comply with all relevant Standards, Specifications, Regulations and Procedures as specified throughout the RFP.

5.2 Site Acceptance Testing ("SAT")

5.2.1 All relevant Signalling systems, sub-systems and Equipment shall undergo and pass SAT before Commissioning.

5.2.2 The Bidder shall be responsible for SAT.

5.2.3 The SAT shall be conducted by a railway Signal Engineer or Technologist, registered with the Engineering Council of South Africa ("ECSA") as a Professional Engineer or Professional Technologist and who has undergone training for the specific system, sub-system or Equipment and have experience in performing SAT's.

5.2.4 The person(s) responsible for the SAT shall not have been involved in any Design, manufacturing, assembling, FAT, or Installation activities relating to the system, sub-system, or equipment to be tested.

5.2.5 The Bidder shall submit a SAT Method Statement to PRASA for approval before any SAT commences. The Method Statement shall clearly indicate:

a) All systems, sub-systems and equipment that shall be included in the SAT, and which shall be omitted.

b) Specification against which the SAT shall be conducted.

c) Method of conducting the SAT for each system, sub-system, and equipment.

d) Details, including experience reports, of people who shall be conducting the SAT.

e) Where practical, all SAT's shall be done under OBT conditions, prior to the final Testing and Commissioning Occupation.

5.2.6 The Bidder shall invite PRASA to all SAT's taking place at least 21 working days prior to commencing of the SAT. Should PRASA not be able to attend, PRASA shall give the Bidder permission to continue or request the dates for the SAT to be changed. PRASA shall not be held liable for any delays caused by this unavailability.

5.2.7 The Bidder shall submit all duly signed SAT Test certificates and associated Test sheet to PRASA for information purposes, prior to Commissioning.

5.2.8 PRASA accepts no accountability nor liability for any SAT conducted, despite any checks done or inputs given by any of PRASA's agents.

5.3 Final Testing and Commissioning

5.3.1 Final Testing and Commissioning shall be done by a PRASA approved Test and Commissioning Engineer provided by the Bidder.

5.3.2 Once the Bidder is convinced, he shall be ready for Final Testing and Commissioning, he shall agree with PRASA on a suitable date for the activity, at least 21 working days prior to proposed date.

5.3.3 The Bidder shall submit a comprehensive Final Testing and Commissioning Method Statement to PRASA for approval before any Commissioning commence.

5.3.4 The Bidder shall be responsible for providing a complete Testing and Commissioning team as per the Method Statement, as well as all tools and Equipment required for introducing, Testing and Commissioning of the system.

5.3.5 The members of the Bidder’s Testing team shall have not been involved in any Design, manufacturing, assembling, FAT or SAT activities relating to the system, sub-system, or Equipment for which that member is responsible during the final Testing and Commissioning.

6 DECOMMISSIONING, DISMANTLING AND REMOVAL

6.1 General

6.1.1 The Bidder shall, at a minimum, ensure that:

a) The decommissioning, dismantling and removal shall comply with all relevant Standards, Specifications, Regulations and Procedures as specified throughout the RFP.

b) The Bidder shall be responsible for the decommissioning, dismantling and removal of all redundant, damaged, and vandalised railway Signalling Equipment.

c) The Bidder shall remove all visible redundant signal cable and all visible signal bases including unused signal biscuits.

d) All unused buried signal cable may be abandoned.

e) The Bidder shall submit a Method Statement for the decommissioning, dismantling and removal of all equipment to PRASA for approval before commencing any work.

f) The Bidder shall dispose of the decommissioned equipment according to the process described in the RFP.

g) The Bidder shall complete the decommissioning and removal of visible redundant signal cable within 14 calendar days after the Commissioning of any Section.

h) The Bidder shall complete the Decommissioning, dismantling and removal of outdoor Signalling Equipment no later than 40 calendar days after the commissioning of any Section.

7 WARRANTIES

7.1 General

7.1.1 The Bidder shall, take full Warranty responsibility and liability for all Restored Equipment and Works that has been tested, commissioned, and handed over to PRASA from the date of hand over for a period of 365 calendar days.

a) Warranties shall, for all Signalling related Works at a minimum, be valid and cover:

- Replacement of all faulty Equipment and Components.
- Tracking and tracing and correcting of faults

b) Failures caused by the environmental and infrastructure conditions as specified throughout the RFP including, but not limited to:

- Any equipment or components damaged due to exposure to extreme direct sunlight and elevated temperatures
- Any equipment or components damaged due to continues exposure to high humidity
- Any Equipment or Component failure due to corrosion