PASSENGER RAIL AGENCY OF SOUTH AFRICA

Supply and installation of overhead track equipment for railway crossovers

CIDB (Construction Industry Development Board) =3EP and above

(NOTE: project will be executed on alternative and direct current high voltage environment)

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1. Specifications and standards

The following publications (latest editions) are referred to herein and shall apply:

1.1 Metrorail rail: project specification
1.2 BBC 1678 Bonding on All Types of Rails
1.3 CEE 0038.87 Compression Fittings on Stranded Aluminium Conductors
1.4 CEE-0054 ISS 83 Section Insulators for 3kV DC OHTE for both High and Low Speed Traffic
1.5 CEE 0128.85 Maintenance of 3kV DC Electrification
1.6 CEE241 Installation of Contact wire
1.7 BBH2161 Requirements for 160mm^2 All Aluminium Jumper Conductor
1.8 BBB1649 Concrete Foundation Direct Plant (Concrete Mast)

1.9 All specifications and standards referred to in the specifications mentioned above are applicable.

2. General

2.1 Metrorail reserves the right to inspect and / or test any material or equipment during the installation process.
2.2 Completion of work shall subject to the approval of the Regional Electrical Engineer or the regional Technical Officer.
2.3 All fittings, accessories or apparatus which may not have been specially mentioned in the scope of work/ specification, but which are otherwise necessary for the satisfactory construction and operation of the railway crossovers shall be deemed to have been included in the scope supply.
2.4 All work undertaken by the contractor shall have a minimum of twelve months guarantee after the acceptance of completion by Metrorail Technical Officer or Electrical Engineer.
2.5 Existing material to be dismantled and removed remain the property of Metrorail.

3. Scope of work

The Nature of work involves the following:

3.1 Supply and installation of overhead track equipment and all the associated works for the railway crossovers at Cordelfos and Rebecca.
3.2 All the accessories that are needed to suspend or string all the overhead wires shall be supplied and installed by the contractor, e.g., contact wire, tiger wire, single suspension, insulators, jumpers, section insulators, steady arm, clamps etc.
3.3 All materials required for the work to be completed shall be supplied and installed by the contractor.
3.4 The contractor shall be responsible for the transport to site, off-loading, handling and storage of all materials required for the execution of the works.

3.5 The contractor shall on completion of the works, clear the site of all leftovers or remaining materials such as empty wire drums, wire cut-offs, empty tins, etc. to the satisfactory of Metrorail contract supervisor.

4. Scope of works and area of focus.

4.1 Wire works.

4.1.1 Any conductors supplied as supplementary to the existing system shall match the existing unless specified otherwise. New make-off wiring shall be spliced onto the existing wiring where new termination structures are required. Standard conductor sizes are:
4.1.2 Contact wire: 161 mm² copper wire shall be supplied in continuous lengths of 1830 meter accordance with BBD 7267 Version 2 and installed in accordance with CEE 241.
4.1.3 Catenary wire: 160mm² Aluminium Conductor Steel Reinforced (ACSR).
4.1.4 Feeder Catenary Contact Jumpers (FCC's): 160mm^2 to be replaced with a 160mm² all-aluminium soft stranded jumper in accordance with BBH 2161 Version 1 in line with drawing BBH 2164.
4.1.5 Earth wire: 61mm2 ACSR Conductor shall be supplied and installed.
4.1.6 Dropper wire: shall be the stainless-steel type.
4.1.7 Maximum span length in the Gauteng region is 67m.
4.1.8 All terminations shall comply with Drawing CEE-TPB-3.
4.1.9 Spring terminations devices shall apply across the section and all thimbles and Crosby clamps shall be stainless steel throughout.

4.2 Section insulators

4.2.1 The contractor shall supply and install numbering plates for all section insulators supplied under this contract.
4.2.2 Section insulators shall only be cut into the overhead wires where the separation between contact and catenary wires is not less than 750 mm after installation of the section insulator.
4.2.3 It is the contractor's responsibility to smooth out kinks on contact wire because of tensioning or other activities.
4.2.4 The contractor shall supply and install section insulators at identified locations, these shall conform to the specification CEE-0054-83

4.3 Insulators

4.3.1 All insulators shall be replaced with the vandal proof type.
4.3.2 All such new Insulators shall be of the silicone composite type, adequately rated for the specific voltage and have an ultimate mechanical strength in tension of not less than 54kN, and to SANS standards. The minimum creepage path shall be 450 mm.

4.4 Earthing, bonding, and surge suppression

4.4.1 Before any welding connection, the surface(s) shall be thoroughly prepared as per detailed instructions to ensure a strong and continuous bond. The galvanizing of the structures shall be removed with a grinder, and the surface where the exothermic weld is to be performed should be thoroughly cleaned.

4.4.2 The area where the galvanizing was removed shall be treated with zinc spraying, hot – patch soldering, or coated with zinc-rich paint complying with the requirements of SABS 920.

4.4.3 All welded joints shall be "hammer tested" to ensure that the mechanical strength of the joints is sound. Welded joints shall also be painted.

4.4.4 PRASA's Technical Officer shall inspect and approve the work before any Grading Ring is covered by soil.

4.4.5 Rail continuity Bonds – All joints in the rail shall be bonded with 4 x 96 mm2 PVC sheeted steel cables. The continuity bonds shall be bolted to the web of the rail using the Expanding collar system. The ends of the bonds shall have lugs crimped to it, which shall then be fastened to the rail using the Expanding collar system.

4.4.6 Cross bonds – are applied between various tracks that share the return current. It consists of a 96 mm2 PVC sheeted composite bond that is fastened to the web of the rail using the Expanding collar system. Cross bonds shall be provided at intervals not exceeding 500 m.

4.4.7 Mast to rail bonds – shall exist in spacing not exceeding 350 m (5 spans). They shall consist of a 2x 96 mm2 PVC sheeted bond that is fastened with WAM Stud and Lug to the mast and fastened to the web of the rail using the Expanding collar system. The end bolted to the rail shall have a lug crimped to it, which shall be fastened to the rail with a WAM stud. Where no earth wire is connected to the mast, 4 Mast to rail bonds shall be provided.

4.4.8 A 95mm2 composite cable shall be supplied and installed for all mast to rail bonds. Rail bonding fasteners shall comply with BBB6017.

4.5 Concrete foundations

4.5.1 The contractor will be required to supply and install foundations at precise locations as directed by authorized PRASA personnel.

4.5.2 The Contractor shall meet all requirements for the:

4.5.2.1 Setting out of foundations,

4.5.2.2 Excavation and barricading of foundations,

4.5.2.3 Setting and positioning of foundation top boxes,

4.5.2.4 Casting of the concrete and the removal of foundation top boxes specified in specification CEE-0017-83.

4.5.3 The concrete used for foundations shall be in accordance with specification S420. The strength shall not be less than 25Mpa after 28 days. PRASA will require cube test certificates for each foundation to be supplied by the contractor.

4.6 Masts and mast numbering

4.6.1 The mast pole numbers shall be stenciled on the existing mast poles in accordance to drawing CEE-TW-646.

4.6.2 The contractor shall clean and paint the area before stenciling as per specification CEE.0045

4.6.3 The contractor shall supply and install masts at locations identified.

4.6.4 The supply and installation of the mast base insulation

4.7 Care for the site

4.7.1 From the date on which the Site is handed over to the Contractor to the date of the issue of a Certificate of Completion, the Contractor shall take full responsibility for the care of the Works and the Employer's Assets on Site and of all Plant intended for incorporation into the Works and materials on the Site intended for incorporation into the Works.

4.8 Overall staffing and key personnel

The contractor shall provide qualified and experienced professional staff for the following positions. All qualifications shall be SAQA accredited.

4.8.1 Site Supervisor
4.8.2 Erectors or Traction Linesman
4.8.3 Flagman
4.8.4 Construction Health and Safety Officer

4.8.5 Site supervisor
4.8.5.1 Each team of Erectors or Traction Linesmen shall be supervised by a Site Supervisor.
4.8.5.2 All work shall be supervised by a Site Supervisor with minimum 5 years' experience in the installation, construction, and commissioning of 3kV Overhead Traction DC System.
4.8.5.3 A minimum of two site supervisors required.

4.8.6 Erectors
4.8.6.1 A minimum of two teams comprising of 3 Erectors or Traction Linesmen per team.
4.8.6.2 All staff that will climb on structures shall have a minimum of 5 years' experience as an Erector or Traction Linesman.
4.8.6.3 Each Erector/Traction linesman shall be supported by at least two general workers/ process workers.

4.8.7 Flag man
4.8.7.1 A minimum of three qualified flagmen shall be deployed for each team or occupied section.

4.8.8 Construction health and safety officer

The desired minimum qualifications for the Construction Health and Safety Officer are as follows:

4.8.8.1 Minimum of 3 years diploma or degree in safety management, and 3 years industry experience as a health and safety officer.

5. Railway crossover

5.1 Cordelfos railway crossover

5.1.1 Make-off at 5/515 mast location.

5.1.1.1 Tiger wire

5.1.1.1.1 Strape

5.1.1.1.2 Insulators

5.1.1.1.3 Turnbuckle

5.1.1.1.4 Straining clamps

5.1.1.2 Contact wire.

5.1.1.2.1 Ending cone.

5.1.1.2.2 Turnbuckle (spring)

5.1.1.2.3 Insulators

5.1.1.3 FCC jumper

5.1.1.4 64 meters of droppers from mast location 5/515 to 5/579

5.1.2 Second TB (5/579)

5.1.2.1 Gooseneck for the tiger wire

5.1.2.2 Single suspension for the tiger wire

5.1.2.3 Insulator for the tiger wire

5.1.2.4 Steady arm for the contact wire

5.1.2.5 Insulator

5.1.3 Between mast location 5/579 and 5/601

5.1.3.1 Two knuckles

5.1.3.2 22 meters of droppers

5.1.4 At mast location 5/601

5.1.4.1 Single suspension for the tiger wire

5.1.4.2 Insulator

5.1.5 Between mast location 5/601 and 5/639

5.1.5.1 42 meters of dropper wires

5.1.5.2 One section insulator for the tiger wire

5.1.5.3 Two straining clamps for the tiger wire

5.1.5.4 Section insulator for the contact wire

5.1.5.5 Two c jumpers on both sides of the section insulators

5.1.5.6 Two knuckles

5.1.5.7 4 section insulator droppers

5.1.6 At mast location 5/639

5.1.6.1 Single suspension for tiger wire

5.1.6.2 Insulator for the tiger wire

5.1.6.3 Two knuckles

5.1.7 At mast location 5/643 – Double boom

5.1.7.1 Single suspension for the tiger wire

5.1.7.2 Insulator for the tiger wire

5.1.8 Between mast location 5/643 and 6/696

5.1.8.1 Two knuckles
5.1.8.2 Steady arm at the mast location
5.1.8.3 Single suspension for the tiger wire
5.1.8.4 Insulator for the tiger wire
5.1.8.5 Section insulator
5.1.8.6 Two straining clamps
5.1.8.7 Two insulators
5.1.8.8 4 droppers for the section insulator
5.1.8.9 Two C jumpers
5.1.8.10 67 meters of droppers between mast location 5/643 and 6/696

5.1.9 At mast location 5/696

5.1.9.1 Single suspension for the tiger wire
5.1.9.2 Insulators
5.1.9.3 Two knuckles for the contact wire

5.1.10 Between mast location 5/696 and 5/748

5.1.10.1 52 meters of dropper wires
5.1.10.2 Both the tiger and contact wires to continue until mast location 5/748

5.1.11 Make-off mast (New) at mast location 5/748

5.1.11.1 Concrete foundations for the mast and stay wire.
5.1.11.2 Stay wire.
5.1.11.3 Four bolt group
5.1.11.4 Mast base insulation
5.1.11.5 Strape
5.1.11.6 Turnbuckle
5.1.11.7 Straining clamp
5.1.11.8 Insulator
5.1.11.9 Ending cone
5.1.11.10 Mast to rail bonding

N.B. The total length of the crossover is 250m.

5.2 Rebecca railway crossover

5.2.1 Make-off next to the road over rail bridge.

5.2.1.1 Strape for the tiger wire
5.2.1.2 Insulator for the tiger wire
5.2.1.3 Turnbuckle for the tiger wire
5.2.1.4 Straining clamp for the tiger wire
5.2.1.5 Ending cone for the contact wire
5.2.1.6 Insulator for the contact wire

5.2.2 Between make-off and mast location 3/338

5.2.2.1 Two parallel clamps for the contact wire
5.2.2.2 Cross contact wire – less 1m
5.2.2.3 Section insulator for the contact wire
5.2.2.4 Two straining clamps for the tiger wire

5.2.2.5 Two insulators for the tiger wire
5.2.2.6 4 droppers for the section insulator
5.2.2.7 Numbering for the section insulator
5.2.2.8 4 knuckles

5.2.3 At the boom – mast location 3-8

5.2.3.1 Single suspension for the tiger wire
5.2.3.2 Insulator for the tiger wire
5.2.4 At mast location 3/338
5.2.4.1 Single suspension for the tiger wire
5.2.4.2 Insulator for the tiger wire
5.2.4.3 Move the existing wire to the other side.

5.2.5 Between mast locations 3/338 and 2/283

5.2.5.1 Two knuckles
5.2.5.2 Cross contact wire – less than 1m
5.2.5.3 Section insulator
5.2.5.4 Two straining clamps
5.2.5.5 Two insulators
5.2.5.6 Two C jumpers
5.2.5.7 4 droppers on both sides of the section insulators

5.2.6 At mast location 3/238

5.2.6.1 Single suspension for the tiger wire
5.2.6.2 Insulator for the tiger wire

5.2.7 Between mast location 3/238 and 2/229

5.2.7.1 Insulation for both the wires
5.2.7.2 Two straining clamps for the tiger wire
5.2.7.3 Two insulators for the tiger wire
5.2.7.4 Two set of link plate for the tiger wire
5.2.7.5 Two ending cones for the contact wire
5.2.7.6 Two splices for the contact wire

5.2.8 At mast location 3/229

5.2.8.1 Single suspension for the tiger wire
5.2.8.2 Insulator for the tiger wire
5.2.8.3 Steady arm for the contact wire
5.2.8.4 Insulator for the steady arm

5.2.9 At mast location 2/653

5.2.9.1 Single suspension for the tiger wire
5.2.9.2 Insulator for the tiger wire
5.2.9.3 Steady arm for the contact wire
5.2.9.4 Insulator for the steady arm

5.2.10 At mast location 2/707

5.2.10.1 Strape for the tiger wire
5.2.10.2 Insulator for the tiger wire
5.2.10.3 Turnbuckle for the tiger wire
5.2.10.4 Straining clamp for the tiger wire

5.2.10.5 Ending cone for the contact wire
5.2.10.6 Turnbuckle for the contact wire (spring)
5.2.10.7 Insulator for the contact wire

6. Occupations

6.1 Work done by all disciplines shall be completed during these occupations for Metrorail to open the track for normal rail traffic.
6.2 The contractor shall conform to the duration of occupations as laid down by the Technical Officer. Occupation time used by the contractor more than the maximum specified occupation time, will not be paid against overtime rates unless, the Technical Officers aggress upon it in writing before the start of occupation and it can be proved by the contractor that the delays caused by PRASA resulted in an overtime claim. In case the contractor wants to claim standing time.
6.3 Before the end of each occupation, the contractor will be advised in writing of the commencement time and duration of the following occupation.
6.4 There is a possibility of the occupation being granted during the night and during the weekend from 21h00 PM until late.

7. Supervision and protection (To BE PROVIDED BY THE CONTRACTOR)

7.1.1 All work shall be performed under supervision by the contractor's suitable qualified personnel.
7.1.2 Protection should be by means of at least three flagmen in possession of valid flagmen certificate.
7.1.3 The flagmen will be tested (not trained) by Metrorail to ensure their efficiency.
7.1.4 The electrical work must be done by a qualified erectors or linesmen from the appointed contractor.

8. Subcontracting

8.1.1 The contractor shall not make use of any sub-contractors to perform the works or parts thereof without prior permission from PRASA.

9. Finance

9.1.1 Payments shall be made for full functional equipment only, that is, all work completed.
9.1.2 All prices quoted shall be fixed and firm for the duration of the contract.
9.1.3 Penalties shall be applicable for late completion of work and the rate shall be 0.5% of the contract value for each day the work remains uncompleted.

10. Health and safety

10.1.1 The contractor shall comply with requirements of safety legislation and regulation in all respects.

10.1.2 The contractor shall prepare and submit to PRASA at the start of the contract, a comprehensive safety file.

10.1.3 The safety file to be submitted shall include valid certificates of First Aiders, lifting equipment (cranes and slings) and medicals of staff assigned to the work. Notification to the Department of Labour (if required) should also be included.

10.1.4 The site access certificate shall only be issued (to the success bidder) after the evaluation and approval of the safety file.

10.1.5 The contractor shall comply with all applicable legislation and Metrorail's safety requirement adopted from time to time and instructed by the Project Manager/Technical Officer. Such compliances shall be entirely at the contractor's cost and shall be deemed to have been allowed for in the rates and prices in the contract.

10.1.6 The contractor shall be required to work under direct supervision of Metrorail's personnel on site and shall be required to work only in areas which shall be demarcated by barriers.

10.1.7 No work shall commence on site, especially off-loading by gantries or other equipment from trucks, unless the contractor's responsible person has noted the conditions contained in the electrical work permit by signing the work permit form.

10.1.8 The contractor shall not proceed with work before having properly informed and warned all his staff of potential dangers of adjacent live equipment pointed out to him by Metrorail Electrical Officer who issues and control the work permit.

10.1.9 The contractor shall ensure that a safety representative is at site all the times.

10.1.10 The contractor shall make necessary arrangement for sanitation, water, and electricity at the site during the installation of the equipment.

10.1.11 The contractor shall report all incidents in writing to the Project Manager/Technical Officer. Any incident resulting in death of or injury to any person on the works shall be reported within 48 hours of its occurrence.

11. Guarantee and defects.

11.1.1 All work undertaken by the contractor shall be subjected to a guarantee period of twelve months against faulty or inferior workmanship by the contractor.

11.1.2 The guarantee period shall commence the day the installation is formally handed over to and accepted by PRASA.

11.1.3 The contractor shall undertake to repair all faults or defects due to bad workmanship or faulty materials.

11.1.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfactory of and free of cost to PRASA.

11.1.5 The contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7 days of being notified by PRASA of such defects.

11.1.6 Should the contractor fail to comply with the requirements stipulated above, PRASA shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or

material and the contractor shall reimburse PRASA the total cost of such repair or replacement, including the labour costs incurred in replacing defective material.

15. Breach of contract

15.1.1 In the event that the contractor does not commence on the agreed date with the work or does not work at reasonable pace or deliver work of unacceptable nature or otherwise contravenes any of the clauses of these conditions, Metrorail may give the contractor 7 days' notice to rectify or remedy it. Should the contract not comply with this instruction then Metrorail shall be entitled to cancel the contract and claim damages from the contractor.

15.1.2 Should the contractor fail to carry out the work, the Technical Manager shall be entitled to suspend operation and if the contractor fails to remedy any breach within 24 hours after written notice has been given to him. Metrorail shall be entitled to cancel the agreement in which all amounts used by the contractor shall be forfeited as liquidated and ascertain damages and Metrorail shall be free to make such arrangement regarding the carrying out the work as it may deem fit.

16. Duration of the project

16.1.1 Together with his/her quotation, the bidder shall submit a work program detailing the time frames of each task in the form of a Gantt chart or any acceptable formats.

16. Site and site inspections

16.1.1 Bidders shall visit the site before submitting their quotations to thoroughly inspect the site to make themselves (bidders) aware of the nature of work involved.

17. Site-book

17.1.1 A site diary to record all incidents as well as the progress of work done during the occupation shall be kept on site for the duration of the contract.
17.1.2 This book (site diary) shall be used to record any unusual events during the period of the work.
17.1.3 Any delays to the work shall also be recorded such as delays caused by poor weather conditions, delays caused by permits being cancelled etc.
17.1.4 Other delays such as non-availability of equipment from third party suppliers must be communicated to the Metrorail Technical Officer/Project Manager.

18. Penalties

18.1.1 If the Contractor fails to complete the Services within the time stipulated in this Contract

for completion of Services or a part or portion of Services, the Contractor shall be liable to the Employer for an amount calculated at 0.3% of the Contract Price per delayed Day per order, which shall be paid for every Day which shall elapse between the time for due completion and completion of the relevant Services. However, the total amount due under this sub-clause shall not exceed the maximum of 10% of the Contract Price.

18.1.2 The imposition of such penalty shall not relieve the Contractor from its obligation to complete Services or from any of its obligations and liabilities under the Contract.

18.1.3 Such penalties are not payable for late completion of work where the delays are attributed to circumstances beyond the contractor's control, like citizen unrest or strikes, exceptional inclement weather conditions and inaccessibility to work site etc.

20. Security

20.1.1 The contractor shall be responsible for providing security on site until the site is handed over to Metrorail.

20.1.2 Any stolen material shall be replaced by the contractor at his own cost.

21. SHE file checklist

21.1.1 The SHE file checklist is attached and it shall be used to compile the safety file by the successful bidder.

22. Evaluation criteria

Technical or functional requirements

Minimum Qualifications of the technical staff are outlined below. All educational qualifications should be SAQA accredited.

22.1.1 ELECTRICAL INSTALLATION SUPERVISOR

a) National Certificate level 3 (N3) in Electrical Engineering (Heavy Current) or A-brown certificate.

b) Trade test certificate.

22.1.2 ELECTRICIAN

(a) National Certificate level 3 (N3) in Electrical Engineering (Heavy Current) or A-brown certificate.

(b) Trade test certificate.

22.1.3 ERECTOR or TRACTION LINEMAN

a) C Green certificate or A red certificate

b) Working at heights certificate

Technical or functional requirements

Organizational Experience Provide for each successfully completed project/s in the following sequence: Copy of an appointment letter/s on a company letterhead, description of the project, Client name, Client contact (i.e., email and office number), Project start date, project end date, extension of time where applicable, contract value inclusive of VAT. Furthermore, attach completion certificate signed by client or letter from the client confirming successful completion of the project.	60	Score will be based on successfully executed and completed similar projects in the installation/ repair of 3kV DC overhead track equipment (OHTE) and structures in the last fifteen (15) years. Zero (0) Similar Projects/non-submission/incomplete submission = **0** 1: 1 Similar project = **12 points** 2: 2 Similar projects =**24 points** 3: 3 Similar projects= **36 points** 4: 4 Similar projects = **48 points** **5: 5 similar projects = 60 points**
Key Personnel Experience (based on Submitted CVs) of Key Staff a) Electrical Installation Supervisor b) Electrician c) Erector or traction lineman Provide copies of original qualifications and certificates of professional bodies. The copies must be certified by the commissioner of oath. The date on the stamp shall be three months	30	Detailed CVs of the team members who will be used in completing the works must submitted. Scores would be based on the experience in the installation/ repairs of 3kV DC Overhead track equipment. The points will be based on the **three** key personnel listed here. No information provided/incomplete submission = **0 points** 1: Average < 5 years of experience of Key Staff = **6 points**

or less old, before the closing date of the tender. If the qualification has been awarded in other language than English, please provide translation in English. Evaluation will be done on all 3 personnel and maximum points shall be obtained on 3 personnel. Each must have a minimum of 5 years. All educational qualifications should be SAQA accredited.		2: Average > = 5 up to 8 years of experience of Key Staff = **12 points** 3: Average > 8 up to 10 years of experience of Key Staff = **18 points** 4: Average > = 10 up to 15 years of experience of Key Staff = **24 points** 5: Average > = 15 years of experience of Key Staff = **30 points**
Project program (Work plan) Provide project schedule in MS projects that meets the client's timeline requirements and the schedule to cover the following key Milestones: • Project duration within the targeted duration of 6 weeks. • Resource allocation • Critical Path clearly highlighted • Activities showing safety measures to be taken activities included. The overall schedule should clearly indicate sequencing of activities with clear understanding of scope.	10	Score will be allocated for MS Project Schedule provided. No information provided = 0 points. 1: Project schedule provided with relevant activities and 1 of the indicated elements addressed = 2. 2: Project schedule provided with relevant activities and 2 of the indicated elements addressed = 4. 3. Project schedule provided with relevant activities and 3 of the indicated elements addressed = 6. 4: Project schedule provided with relevant activities and 4 of the indicated elements addressed = 8. 5. Project schedule provided with relevant activities and all the indicated elements addressed = 10.

NOTE: The average minimum points of 80 are to be attained in the evaluation criteria stated above for a bidder to be shortlisted for this tender.