

MAHARASHTRA METRO RAIL CORPORATION LIMITED
(Pune Metro Rail Project)

CORRIGENDUM – X

Date:14/08/2018

Tender No.: P1/TR-01/2018
E-Tender Portal S.No. 126

Name of Work: - Design, Supply, Installation, Testing & Commissioning Of Receiving Cum Auxiliary Main Cum Traction Sub Stations Including High Voltage Cabling From Grid Substation, 33kv Cable Network, Ass & Scada System For Pune Metro Rail Project

The revised dates for submission and opening of tender is as follows:

Activity	As per Corrigendum VII	Revised Dates
Date & time of Submission of Signed and Sealed tender	Till 16.00 Hrs. On 22.08.2018	Till 16.00 Hrs. On 30.08.2018
Date & Time of Opening of Tender	On 22.08.2018 at 16.30 Hours	On 30.08.2018 at 16.30 Hours

The following document shall be part of this corrigendum: Addendum No. 2



AGM/Procurement
MAHA-METRO

Addendum No. 02

SNo	Part	Section	Clause	Existing Description	Replaced with
1.	Part 2	Section VII-B	5.3.4.6.2.3 (c)The minimum capacity of the battery shall not be less than 300 AH.The minimum capacity of the battery (each half) shall be as table 4.6, of clause 4.7 of Particular specification.
2.	Part 1	Section IV, Pricing Document	Appendix N, ADJ	Item 51 Description Cable fault locater	Item 51 Description Cable fault locater and Test Van (refer Clause 14.9 of Particular Specification, Section VII-B).
3.	Part 2	Section VII-B	14.9	New clause	Cable Fault Locater and Test Van Refer Annexure G

[Annexure G](#)

(Refer S.No. 2 and 3 above)

New Clause 14.9

14.9 CABLE FAULT LOCATER AND TEST VAN

14.9.1 General Requirements

14.9.1.1 The single-phase measuring system should provide a completely equipped measuring station for all operations related to cable fault location in power distribution cables and cable installations in low, medium & high voltage networks.

14.9.1.2 The system must cater for a quick and precise location of all types of cable faults encountered in practice. The concept must permit an optimal adaptation of the measuring technique to varying conditions of:

- Test voltage
- Surge voltage
- Surge energy

- Measuring Comfort

14.9.1.3 Importance must be attached to system characteristics like:

- A sophisticated safety concept
- A central system control
- Powerful high voltage sources
- Low power input
- Low weight

14.9.2 System Requirements

14.9.2.1 General

14.9.2.1.1 The entire operation control must be carried out via a central operating unit, which comprises the Time Domain Reflectometer(TDR) for fault location and controls the individual high voltage operating modes and the phase selection.

14.9.2.1.2 All operation modes and techniques and the safety control must be fully integrated in the central systems control.

14.9.2.1.3 The system must cater for modern interfaces, preferably USB, e.g. for a memory stick, printer and PC.

14.9.2.1.4 These interfaces must be easily accessible to enable an updating of the measuring system and the recording or logging of all measuring processes.

14.9.2.1.5 An online help shall support the operator. Operation shall preferably be in English language or with the help of Icons.

14.9.2.1.6 Operating errors shall be eliminated by the system.

14.9.2.1.7 Keys with firm functions like "Mains on", "Mains off", "HV on", "HV off" and "Emergency Off" shall be designed as switches with direct functionality.

14.9.2.1.8 Insulation measuring / Resistance measurement: Integrated insulation measurement up to minimum 5 G Ω (with a test voltage of minimum 1000V) and an integrated low resistance measurement facility up to 1 k Ω .

14.9.2.1.9 Capacitance Measurement: The system should be able to measure and display the capacitance value of the test object, to provide additional information.

14.9.2.2 Testing

14.9.2.2.1 Testing with DC voltage up to minimum 80 kV operated from the central control unit, with automatic cut-off after breakdown or overcurrent and recording and logging of voltage and current during the testing period.

14.9.2.2.2 DC testing 0 - 80 kV: DC testing shall be possible in three different steps

- 0 - 8 kV, $I_N = 200$ mA, $I_{max} = 500$ mA
- 0 - 80 kV, $I_N = 12$ mA, $I_{max} = 180$ mA

14.9.2.3 Pre-location

14.9.2.3.1 Pulse reflection measurement (TDR) with digital signal processing and integrated transient recorder.

14.9.2.3.2 Operating modes:

- 3-phase TDR measurement
- Comparison measurement via memory
- Differential measurement via memory
- Averaging and noise suppression
- Operating mode for intermittent faults
- Furthermore, it should have at least a 17" colour VGA TFT display.

14.9.2.3.3 To support the operator, the TDR should have available the following technologies:

- Automatic far end detection in all operating modes
- Automatic adjustment of the parameters
- Adjustable distance related gain correction to show far distant events
- The measuring range should be at least 1000 km
- The sampling rate of the system should be 400MHz
- The system must have a multi trace facility to select the best trace out of several shots (Minimum of 15 traces)
- Automatic fault location, indication and marking of the fault position in all operating modes
- Automatic recording of all measurements
- Measurements must be available as PDF files
- Database software for further processing and recording
- There should be regular software updates possible to provide the latest features
- The system should provide a backup and recovery facility the operational software, in case of malfunction

14.9.2.3.4 High voltage fault location

- Arc reflection method with surge voltages 0 - 4 / 8 / 16 / 32 kV, at high voltages with double surge method with automatic end detection.
- Impulse current method (ICE/current coupling) 0-4 / 8 / 16 / 32 kV with automatic fault detection
- Extended arc reflection method up to 80kV with automatic fault detection.
- One surge pulse per measurement should be sufficient
- Decay method of Fault Location up to 80KV
- Burning (fault conditioning) 0 – 80 kV DC with a minimum I_{SHORT} of 600 mA

14.9.2.4 Pinpoint location

14.9.2.4.1 The integrated surge generator should have a surge energy of at least 3000 Joules in all voltage ranges 0...4kV, 0...8kV, 0...16kV, 0...32kV. It should have all important safety features for the operator and the cable under test. The output voltage of the surge generator should be continuously adjustable between 0 and the maximum value of the selected range.

14.9.2.4.2 Surge method

At least 3000J surge energy in all of the ranges 0...4/ 8 / 16 / 32kV.

Impulse interval: Single shot, 3 to 20 pulse per minute.

Capacitor charging rate shall be at least 1000 J/sec. in order to fully charge the capacitor during pulsing sequences of 3 sec.

14.9.2.4.3 Sheath Faults

- Sheath testing and pinpoint location: 0...5, 10kV (preferable with 15 & 20kV as well)
- Audio frequency equipment with maximum 10W output, but automatic impedancematching and adjustment to the cable parameters
- Identification of the direction of signal flow with three different frequencies, as well as a setting of the Maximum, Minimum and Supermaximum method should be available.

14.9.2.4.4 Surge Generator Unit:

The Surge Generator Unit should be used as thumper for charging of cable under test (i.e. defective cable) till sufficient flashover is achieved at the point of fault. The set should be used in conjunction with Surge Receiver Unit for fault pinpointing.

A suitable band pass filter unit should be supplied to stabilize the ARC at the flashover or the point of fault. The filter should simplify the operation causing less stress, causing minimum damage on the tested cables to detect the high resistive faults. There should be compatibility of TDR, Surge Generator/Thumper with the filter unit. This unit must filter or stabilize the arc at the fault point and record the same in the supplied TDR to compare it with previous trace recorded

without the filter unit in the same core. Suitable coupler for coupling the filter unit with the TDR and Surge generator must be supplied. The filter to have switching elements necessary for the triggering and the coupling of the pulse. After the pre-location using the SIM/MIM method, there should be a decoupling element which should pass the surge generator for making it ready for use in pinpointing the cable fault. The control unit should connect automatically the filters with appropriate coupler with the surge generator and TDR when SIM/MIM mode.

Inductive coupler: Inductive Coupler required for pre-location of high resistance faults with a Surge Voltage Generator according to the Impulse Current Method (ICM).

Capacitive coupler: Capacitive voltage divider required for location of intermittent cable faults up to 40 KV DC to perform the Decay Method.

Integrated Fault Conditioning Unit: This set should be capable for conditioning of high resistive faults in cables to facilitate the fault pre location.

The fault conditioning Unit should have the following features:

- (a) The voltage range should be at least up to 32 KV surge pulse sequence.
- (b) 3000 J Energy shall be released in every 3 sec pulse.
- (c) The unit should display surge voltage, actual capacitor voltage during charging moment, discharging energy, and duration of surge application
- (d) Link shall be given to activate the pre location at any time during conditioning.
- (e) The Unit should be provided with a thermal overload protection and should have auto-reset feature.
- (f) The Unit should be provided with safety earthing facility for safe operation.

14.9.2.4.5 Surge Wave Receiver Unit

The unit must function as a directional acoustic listening device for pinpointing of flashover faults in underground power cables. The unit should be handy & rugged, and should comprise of receivers, headphones, sensors, amplifiers and any other auxiliary item as necessary for operation of the unit. The set should provide detection of both acoustic and electromagnetic pulses emitted from an arcing fault when it is surged. The set should be able to determine the proximity and direction to the cable fault by measuring electromagnetic surge and acoustic emission and also able to measure the time delay between acoustic and electromagnetic signals. In the acoustic mode the set should have a feature to eliminate complete background noise and electromagnetic interferences automatically. It should be able to pinpoint the exact location of the fault. The unit should be provided with an LCD display with backlit feature to indicate the cable route through the electromagnetic signal in bar graph form & the proximity to fault point by a numeric display and acoustic headphone set to receive the acoustic signal for pin pointing the fault point.

For fault pinpointing the offered equipment should fulfill the following points:

- Fault location by the magnetic field and sound signal coincidence method with consisting of a receiver and ground sensor with accessories, headphones, connection cables and transport box or mountings
- High acoustic and magnetic field sensitivity
- Selective measurement of the transit time of the flashover noise with display of the result in milliseconds or meters
- High performance electronic suppression of external noise and interference
- Excellent acoustic characteristics (frequency range 100 Hz to 1.5 kHz)
- Active ear protection by an 84 db(A) limiter

- Measurement of magnetic field and sound coincidence with automatic selection and calibration of the measuring range
- Automatic contactless turn off of the Headset, as soon as the hand reaches the handle
- Indication of cable position in respect to the sensor
- Indication of the direction to the fault
- Built in adjustable filters for the suppression of interference 270 Hz ... 1.5 kHz
- Bright sun readable colour display with the following indications
 - Comparison of last and the new measurement
 - Graphical indication of the magnetic field
 - Peak hold of the magnetic field value
 - Indication of the acoustic signal detection
 - Indication of all adjustments and settings

14.9.2.4.6 CABLE ROUTE TRACER:

The Cable Route Locator should be suitable for cable fault location process of underground cables by identifying the cable from the surface, without excavation. The equipment should be capable of tracing the buried cables with the ability to measure the depth of the cable. The unit should have at least the following features:

- a. The set should comprise of a transmitter & receiver.
- b. The set should be battery operated (rechargeable) and portable type, rugged construction with necessary accessories & bag / case.
- c. The cable tracing should be done with audio & visual signals so as to make it easy to follow & trace the cable route.
- d. It should be possible to detect the depth of the cable (at least 4 meter) at any point by using sufficient wattage of the generator up to 50 watts at least.
- e. Automatic impedance matching should be required for better operations.
- f. It should also be possible to detect the AC signals (50 Hz) from a charged cable without transmitter.
- g. Filters should be provided to optimize the measurements and minimize the ambient noise.
- h. The transmitter of the tracer should be capable of energizing the cable either by magnetic induction or by direct conductive connection to the cable.
- i. The receiver should filter out electric noise and static noise.
- j. The unit should also be able to determine the depth of the cable.
- k. The unit should be suitable to trace cables in areas with multiple energized / de-energized cables in the same route.

a) Audio Frequency Generator:

The audio frequency generator should be ideal for locating the route of underground cable as well as for pinpointing of cable faults when used with receiver and identification of particular cable from the bunch of the cables.

Technical Specification:

LF output power: 0-50 Watt(min.) or more (adjustable manually or automatically)

O/P Frequencies: To be indicated by the bidder/contractor.

Output Adjustment to be specified by the bidder

Permitted load resistance: any short circuit, open circuit, continuous but with reactive load etc.
Power Supply: Unit should be capable to work on mains AC supply with built in charging and battery unit.

b) The audio frequency receiver:

The audio frequency receiver set should be battery operated and suitable to above frequencies.
The receiver should be connected directly to the search coil. The coil can be rotated to 0-45 degree

14.9.2.4.7 Cable Identification Set:

The system is to be used for selection of single core and multi core cables from a bunch of cables. The system should consist of a Transmitter and Receiver unit and should be light, portable, with facility to identify even live cables. The unit should be completely menu – driven, with graphic display.

Technical Data

Transmitter: Output voltage: 300V (min.) (15 pulses/min)

Output current: 180A (min.)

Power Supply: 230v, 50 Hz/ Battery operated

Receiver: Display: Graphic LCD/ Analog signal

Sensitivity: 100%; at 400

Power Supply: Battery operated

14.9.2.4.8 The receiver must be compatible with other components

14.9.2.4.9 Frequencies

50 Hz, 60 Hz, 100 Hz, 120 Hz, 491 Hz, 982 Hz, 8.44 kHz (preferable range, other also acceptable on design verification & approval)

14.9.2.5 Connection cables

14.9.2.5.1 LV connection cables

The following options should be available:

- 50 m mains cable 2 x 2.5 mm², 50 m earthing cable 16 mm², 15 m FU cable, Hand-operated mains cable drum with slip ring, Hand-operated earthing cable drum, Isolation transformer 3.6 kVA
- 50 m mains cable 2 x 2.5 mm², 50 m earthing cable 16 mm², 15 m FU cable, Mains cable drum with slip ring and band recoil, Earthing cable drum with band recoil,

Isolation transformer 3.6 kVA

14.9.2.5.2 HV connection cables

The following options should be available:

1-phase with 50m, 80kV HV EPR cable, hand-operated

14.9.2.6 Safety

- Separation of operational and protective earth in conjunction with an isolating transformer
- Protective earthing cable min. 16 mm² for equity in potential between cable test van and station ground
- Fault voltage protection facility for monitoring of the maximum permissible contact voltage between test van and surrounding earth, and of quick voltage increases with maximum 1/Vs during high voltage operation
- Monitoring of the resistance of the connected station ground and protective earth for safe parameters in conformity with VDE
- Safety switching device with warning lights and an external Emergency-Off switch
- Automatic discharge and earthing switch
- Safety contacts on the doors
- Plexiglas partition panel between HV cabin and operating cabin

14.9.2.7 Other Options

Retrofitting of the following optional items should be possible:

14.9.2.7.1 Furniture

Ergonomic work place with adequate desktop, functional floor cupboard and revolving chair with locking facility (including PC as per system requirement).

14.9.2.8 Supply

A supply of 3.5kVA must be made available.

14.9.2.9 Vehicle

Equipment shall be compact in size and shall be possible to use any compact vehicle with a suitable payload.

14.9.2.10 Quality

The instruments and systems shall be produced to meet the ISO 9001:2000 standard.

The system must be CE certified.

14.9.2.11 Training: 05 days training to Maha-Metro Engineers.

14.9.2.12 Warranty: 05 years comprehensive warranty.