STANDARD TECHNICAL SPECIFICATION FOR UNDERGROUND CABLE FAULT LOCATING EQUIPMENT AND OTHER ACCESSORIES

TECHNICAL PROPOSAL AND SPECIFICATION

1. GENERAL REQUIREMENTS :

The cable fault locator shall be capable of locating /detecting all underground transmission and HT distribution (Paper Insulated /XLPE) power cable fault up to 33 KV network. The equipment shall be properly wired and capable of detecting open circuit/short circuit /low insulation /lashing/earth /Series Resistance type cable faults in underground cable. The equipment shall be capable to deliver high output energy that is necessary to ascertain easily to condition and breaking down faults in power cables, joints and terminations and long cable network. The equipment should be capable of detection of faults in mix cables of PILC & XLPE. All constituent part of the equipment for cable fault locating set should be independent and separate in nature for easy transportation.

The Cable fault locator shall consists of the following components which, if required, shall be used in conjunction with other:

a) Time Domain Reflectometer suitable for H.V. Power Cable with required accessories.
b) HV Surge Wave Tester or Impulse Generator with 50 meter H.T cable and other required accessories.
c) Cable fault pinpointing set with headphone and sensing mechanism (rod).
d) Murray loop test set with required accessories.
e) Cable Route Tracer instruments with headphone and other required accessories. The set shall have facility for depth measurement of cable up to a minimum depth of 5 mtr.
f) Cable identifying instrument with required accessories for identification of a particular cable out of a bunch of live and or dead cables.

The dimension of those components and their accessories shall be such that the entire assembly along with each component can be suitably mounted in a mid size vehicle with adequate space left for the operator for free operation of the instrument.

Test Technique:

Test technique should be based on differential arc reflection so as to eliminate unwanted and confusing reflection leaving only locations of fault. This differential arc reflection technique should be possible without a need to use extra channel of healthy phase.

Multi trace capturing (at least ten) should be possible with single shot of HV in arc reflection method and users should be able to select the best trace out of all stored traces.

Fault conditioning (prove/burn and A.R.M) and fault pre location techniques (TDR, ARM and ICE) should be integrated to one package /unit for ease of use. Selection of HV operations should be easy to use to avoid confusion without Human intervention.

Built in arc reflection filter or arc stabilization unit should be an inductive filter circuit, so that the output pulse has minimum attenuation in it.

The unit shall be versatile, capable and supportive to locate fault in a wide variety of power distribution cable networks through modern, integrated coupling for multiple cable testing and fault locating technologies to reduce the fault locating time. The unit shall be complete in all respect with the necessary items , accessories and test techniques and shall be ideal to ensure its maximum performance to detect faults of conditions for short , medium or long underground distribution cable networks .

2.1 H.V Surge wave tester or Impulse Generator

1. Surge Voltage Range:-

a) 0-8KV continuously adjustable

b) 0-16 KV continuously adjustable

c) 0-32 KV continuously adjustable

2. Output Capacity : Minimum 1500 joules at 8 KV, 16 KV and 32 KV full range. Fault burning facility should be integrated.

3. Current output : Shall have current that corresponds to 1500 Joules at any selective voltage output

4. Impulse frequency : 20, 30 imp. / Min

5. Indication : Meter to indicate output KV and overheat LED indication, Precision of KV meter should be <=1.5%

6. Power Supply : 230 V± 10%, 50 HZ with external isolating transformer.

7. Accessories :

a) 50 meters screened HV cable with clamp (assembled on a drum) – The HV Cable shall have insulation of at least 45 KV grade and shall have sufficient durable insulation property so as to ensure safety of operator and others who may come in contact with the HV cable when operating at highest operating voltage. The HV cable shall be flexible in nature so that it's insulation property does not detoriate due to bending.

b) 50 meter 10sqmm earthing cable (assembled on a drum).

c) 50 meters mains supply cable (assembled on a drum)

2.2 Pre-location (Micro processor based) :

2.2.1) High Voltage Method: Single impulse method, multiple impulse method (SIM/MIM) and Impulse current method (ICM) for determination of high resistive faults.

Specification of the instrument:-

1) Memory : - can store at least 100 traces.

2) Measuring Ranges : 0-10 KM (min)

3) Sampling Rate : 200 Mhz (5 nano -seconds)(min).

4) Resolution :- <=0.5 meter (at v/2 = 80 m/us).

5) Accuracy : - <=0.5%

6) Modes : - TDR, impulse current MIM, SIM, ICM.

7) Type of protection :- IP54.

8) Display :- LCD TFT colour display .

9) Colour Setting :- Automatic .

10) Gain range Setting : - Automatic

11) Sensitivity of Input Divider : - 0-20 db

12) Pulse width of transmitting pulse : - 40ns-10µs

13) Output Impedance : - shall have selectable property 10-250 Ω.

2.2.3 Bridge Method: - For low and high resistive cable faults, cable sheath faults, core to core faults, unshielded cable faults Fully automatic setting and capable for different cross section of cable. Results shall directly be displayed in the meters as well as in percentage of total cable length.

Main features: a) Cable and cable sheath testing up to 10 KV

b) Resistance Measurement

c) Cable and cable sheath fault pre-location with high precision.

d) Definable cable sections with individual adjustment of length, Cross section and conductor material.

e) Integrated discharge unit.

f) Step-less voltage adjustment.

g) Automatic reporting function.

h) Mains and battery operated.

i) Menu control via one button operation.

Specification of instrument:-

1) Power Supply :- 230 V± 10%, 50 HZ.
2) Output Voltage :- 0-10 KV
3) Measuring method : - Murray Bridge (Loop) Method.
4) Measuring Current : - 50mA (max)
5) Accuracy : - ± 0.1%.
6) Display : - Digital LCD display.
7) Battery Operation : - Integrated rechargeable battery

2.3 Pin pointing:

2.3.1 Acoustic Method:-

Specification of Instrument:-

1) The unit shall be light weight and to be provided in a suitable carrying case to hold all the components and sensitive to detect direction of the faults up to a minimum distance of 20 feet. The set shall be suitable for pinpointing all the faults those may occur in H.T. system including dead short circuit between phase(s) & earth and open circuit of phase(s) conductor with normal adequate insulation.

2) There shall be back ground interference elimination via selectable filter band.
3) Acoustic Mute Function :-To locate fault in crowded area.
4) Acoustic Frequency Range :- 20 Hz to 20KHz.
5) Display indication :-
   a) LCD bar-graph displays with back light facility/any other digital display.
   b) Indication of signal strength of acoustic and magnetic channels.
   c) Internal battery level status.
6) Controls :- Separate controls for acoustic and magnetic signal.
7) Power Supply :- Dry Cell /Rechargeable battery.
8) Accessories :-Ground Microphone, connection leads, special head phone, caring sticks, carrying case.
9) The unit shall have arrangement for receiving the Electromagnetic and audio signals generated from low resistance faults due to application of voltage and propagated thorough surrounding soil/bricks/sand/concrete structure etc. for the purpose of pinpointing of fault.
10) Fault distance shall be displayed when reaching near the fault.
11) Acoustic pin pointing combined with propagation time measurement (with indication of fault distance).

2.4 Cable Route Tracer System:-

The cable route tracer system shall be user friendly and suitable to locate the exact location of underground cables and cable laid in PVC/GI pipe along the busy roadside, depth measurement up to 5 meters and ground survey of underground cables to get quick accurate results.

Required Features:-

1) Pinpointing active power lines and other utilities where AC is present.
2) Operation in multiple frequencies
3) Push button depth measurement up to 5 meters.
4) High power at low frequency suitable to solve problems in multi point Grounding situations.

Specification:-

A) Transmitter:-

i) Operating Frequency : - At least three frequencies (low, medium , high in frequency range 480 Hz to 82 KHz)
ii) Impedance : - suitable matching impedance (Selectable)
iii) Power output : - suitable with selectable range
iv) Indications :-
   i) Meter Indication of related transmitted power
   ii) Charging status of internal rechargeable battery.
v) Power Supply :- 230 V, 50 Hz AC or 12 V, 6Ah(Min) internal Rechargeable battery and Ext 12V DC source.

B) Receiver

i) Receiving Frequency :- Passive 50/60 Hz and active three frequencies matching with transmitter.

ii) Gain :- Up/Down button for automatic centering & Manual control

iii) Range :- With suitable dynamic range.

iv) Wide band - band frequency :- 480 Hz to 82 KHz .

v) Accuracy :- (1-6)% at normal condition (<=1.5m).

vi) Power Supply :- Suitable dry and rechargeable battery.

vii) Accessories :-Suitable with transmitter and receiver.

2.5 **Cable Identification Instrument**

For single and multi core cables , for identifying a particular cable from a bunch of cables for HT network with help of generator , receiver and directional tong:

A. Pulse Transmitter:

1) Impulse voltage : 50V or higher, 15 pulse per minute (min)
2) Impulse current : 100A or higher.
3) Power Supply : 230 V ±10% AC, 50/60Hz, rechargeable battery.
4) Pulse indication : LED of light up with frequency of current pulse
5) Transmitter : Integrated in transport case
6) Degree of protection : IP50

B. Pulse Receiver

1) Sensitivity at direct connection of transmitter : 100% at 400 Ω loop resistance
2) Degree of protection of receiver : IP52
3) Sensitivity at inductive signal injection : 100 % at loop resistance < 6Ω
4) Load current Measuring range : 180 ± 5%, 50/60 Hz.
5) Identification ton : 150 mm opening. Carrying case to be provided

2.6 Cable Drum for HV surge wave tester or Impulse Generator

50 meter HV cable, earthing cable and power cable each.

3.0 Note:

a) Each bidder shall fill up all the points as noted in the GTP including the model nos. of each components of the cable fault locator and it's accessories they are offering. Each and every components of the cable fault locator and it's accessories shall be of own make of the bidder. Authorized dealers of the Original manufacturers of the items shall not be allowed to participate in the Tender but with special request of the manufacturer, WBSEDCL may consider placement of order on the dealer on behalf of the said manufacturer and/or they may be allowed to receive payment, on behalf of the Co., provided that all responsibilities & guarantees, as per terms of the Tender Specification and order be under taken by the said manufacturer.

b) During Techno-commercial evaluation each bidder shall demonstrate each offered component of the cable fault locator and it's accessories by pre-locating/ pin pointing/cable Route tracer & depth measurement/cable identification of the entire ranges of HT cable faults those may occur in WBSEDCL system in real field and/or by simulation technique in presence of Testing Engineers of Distribution Testing Department, WBSEDCL. The demonstration shall be comprehensive and in case it is found that it is not able to pre-locate/pinpoint/ cable route tracing & depth measurement/cable identification of all types of fault and in case it is found that functioning of any component for which it is used is not satisfactory, the bidder will not be considered as technically successful bidder. The decision of WBSEDCL, will be final in this regard. For arranging such demonstration, 20(Twenty) days advance intimation will be issued to the bidders fixing up the date for such demonstration. The bidder will have to report along with those instruments & their complete literatures and competent engineer for such demonstration to the Chief Engineer(Testing), Distribution Testing Department, on that particular day(s). If the bidder fails to be present for such demonstration on that particular day without sufficient reasons, their bid documents will be liable to be cancelled.

c) Each participating bidder shall have to upload the literatures & manuals of each and every components of the cable fault locator.

d) Each bidder shall submit satisfactory performance report of the offered set for not less than 3(Three) years from any power utilities, Govt. Departments.

e) Each and every components of the equipments shall be guaranteed for a period of 05(Five) years from the date of delivery of those equipments.

f) After placement of P.O. to the successful bidder, the bidder will have to install and commission those instruments in a vehicle arranged by WBSEDCL and they will have to train our Engineers about the operation of entire range of the instrument as well as through physical demonstration at site.

GTP FOR HT CABLE FAULT LOCATOR & OTHER ACCESSORIES

Sl. No.	Item to be replied	To be filled up by the Bidder
1	Name of the Manufacturer	
2.	Office Address	
3.	Manufacturing Unit Address	
4.	Whether the bidder is the OEM of the tendered items (Yes/No)	
4(a).	Whether the bidder has comprehensive service centre along with competent Engineers, if yes, mention the address.	
5.	Model Names of the H.T. Cable Fault Locator and their Accessories offered by them (Mentioning Item wise Model No.)	
	a) Time domain Reflectometer	
	b) Surge wave Tester or Impulse Generator	
	c) Cable fault pinpointing instrument with headphone and sensing rod.	
	d) Murray loop test Set	
	e) Cable Route Tracer with audio headphone and other sensing device and depth Measurement up to 5 mtr.	
	f) Cable identifying instrument	
	g) Instrument for depth measurement of cable	
6.	Whether the Cable Fault Locator Assembly is capable of locating cable Fault for cables up to 33KV cable	
7.	Whether the Cable Fault locator assembly is capable of locating all types of faults including Pinpointing in Paper/XLPE HT Cables	
8.	Whether the Cable Fault locator assembly is capable of locating faults including pinpointing of all types that may arise in cable network as follows: a. Dead Earth Fault between	

	Phase(s) & Earth. b. High resistance Earth Fault between Pahse(s) & Earth c. Dead Phase to Phase Fault d. Resistive Phase to Phase fault e. Open circuit fault in Phase(s) f. Open circuit fault in Phase(s) with both end short circuit to Earth g. Series Resistance faults h. Cable Sheath Faults i. Intermittent Faults between Phase(s) to Earth or Between Phases	
9.	a. Model no. of Surge Generator b. Range of Voltage that can be applied through surge Generator in different steps c. Maximum Voltage that can be applied in different steps d. Whether the Maximum Voltage is continuously variable from zero voltage e. Maximum energy output capacity in Joules at maximum range and at intermediate steps. f. Whether Fault Burning facility is integrated to the surge Generator g. Whether surge generator may be used for High voltage tests of UG cable h. Current output of impulse generator i. Whether the Impulse Generator is suitable for thumping j. Impulse frequency of Surge Generator per Minute k. Input Power Supply with frequency and whether there is any isolating Transformer l. Length of H.T. cable & earth cable associated with surge generator m. Voltage Grade of the H.T. cable associated with surge Generator and type of insulation. n. Whether that HT cable conforms the relevant specification for Human safety. o. Whether the cable is wound on drum which is easily rotatable. p. Sizes of surge Generator	

	and it's complete assembly q. Supply voltage of the surge generator r.Voltage grade of HV cable insulation s.Whether the surge generator is suitable for application of High Voltage	
10.	a. Model no. of Time Domain Reflectometer b. Whether the TDR is capable of pre-location of cable fault by SIM, MIM & ICM mode of operation. c. Whether the TDR can be used in conjunction with the surge generator d. Memory capacity of TDR(In no. of traces those can be recorded) e. Maximum Length of cable for which the instrument is capable of pre-location of fault f. Sampling rate of TDR g. Method of Colour setting (Automatic/Manual) h. Gain range setting (Automatic/Manual or both) i. Display type j. Accuracy k. Resolution l. Type of Protection m. Sensitivity of Input divider n. Pulse width of Transmitting pulse o. Output impedance (Whether selectable) Supply voltage of the surge generator	
11.	Model no. of Murry loop test set	
	a. Input power supply	
	b. Output Voltage	
	c. Measuring Method	
	d. Measuring Current	
	e. Accuracy	
	f. Display	
	g. Battery operation and it's type	
	h. Whether the instrument is suitable for resistance measurement	
	i. Whether the instrument is capable of pre location of cable and cable sheath faults with	

	precision	
	j. Whether the instrument has the facility of providing cable sections and their length and conductor material as input and thereby giving automatic of distance of fault.	
	k. Whether the instrument can be operated with Battery as well as Mains supply.	
	l. Whether the voltage can be varied continuously	
	m. Whether the menu can be controlled via one button operation	
	n. Whether it has built in arc reflection filter or arc stabilization unit should be an inductive filter circuit, so that the output pulse has minimum attenuation in it	
12.	Model no. of cable fault Pin pointing set	
	a. Weight and size of the instrument	
	b. Minimum & Maximum Distance to which the set can detect direction of fault	
	c. Whether the instrument has the capability for background interference elimination via selectable filter band	
	d. Whether the instrument has the facility of acoustic mute function to locate fault in crowded area.	
	e. Acoustic frequency range of the instrument	
	f. whether the display is LCD with back light facility	
	g. Whether the instrument has separate indication of acoustic, magnetic & battery status display.	
	h. Whether the instrument has separate control of acoustic & magnetic signals	
	i. Power supply of the instrument (Rechargeable Battery/Dry Cell)	
	j. Whether the instrument displays the distance of fault	

	when reaching near the fault	
13.	Model no. of cable Route Tracer system	
	a. Whether the set is capable of pinpointing active power lines where AC is present/operation in multiple frequencies/push button depth measurement upto minimum 5 mtr./High power power at low frequency suitable to solve problems in multi point grounding situations.	
	b. Operating frequency of the transmitter	
	c. Whether the transmitter indicates about the transmitted power and charging status of internal Rechargeable battery	
	d. Whether the transmitter has suitable selectable matching impedance	
	e. Whether Power output of the transmitter is suitable with selectable range.	
	f. Power supply voltage of transmitter	
	g. What is the receiving frequency of the Receiver	
	h. whether the Receiver has suitable dynamic range	
	i. Whether the Receiver has suitable dynamic range	
	j. Frequency band width of the receiver	
	k. Accuracy of the receiver	
	l. Power supply of the receiver	
14.	Model no. of cable identifying instrument	
	a. Whether suitable for identifying a single or multicore cable out of a bunch of cables.	
	b. Impulse voltage of transmitter and current	
	c. Indication of pulse of transmitter	
	d. Power supply of the transmitter	
	e. Degree of protection of the transmitter	

	f. Sensitivity at direct connection of the Receiver	
	g. Sensitivity at inductive signal injection of the receiver	
	h. Load current measuring range of the Receiver	
	i. Opening of identification tongs	
15.	Whether agreeable to demonstrate the equipment at the fixed date in WBSEDCL cable network	
16.	Whether agreeable to train WBSEDCL Engineers at their full satisfaction about operation of entire range of instrument and for physical demonstration of the equipment after placement of P.O, if qualified.	
17.	Whether agreeable to guarantee each and every components of the instruments for 5 years.	
18.	Whether submitted satisfactory performance of each and every components of the equipment from any power utility/Govt. department for a period of 3 years.	