

ANNEXURE-VIII

**SCOPE OF WORK AND JOB SPECIFICATION
FOR
WORKSHOP EQUIPMENT FOR ELECTRICAL**

CLIENT:

RFCL

PROJECT:

**REVIVAL OF RAMAGUNDAM FERTILIZER
PROJECT**

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1. INTRODUCTION

This Document provides the technical requirements for workshop equipments for electrical.

TERMS AND DEFINITIONS

BIDDER	Agency (Vendor/Package Vendor) that makes the bid in its name and takes the total responsibility for the job irrespective of support from any other sub-agency.
SUB-VENDOR	Sub-agency identified by the Bidder at the bid stage for execution of a pre-defined part of the work.
BID	Bidder's offer
BID DOCUMENT	This tender document.
Client	M/s. RFCL
PMC	Engineers India Limited (EIL)

2. SCOPE OF WORK & SUPPLY

2.1 Bidder's scope of work and supply for the workshop equipments along with all Standard Accessories as per Detailed Technical Specification and impart training at RFCL Site to the Operating Staff (wherever applicable). The complete electrical workshop is to be established for RFCL Complex.

Bidder to note that electrical workshop equipment shall be of the makes indicated in the list or its equivalent make (if applicable)

Sr. No.	Item Description	Qty.	UOM	TAG NO.	Tentative Makes
					Or Equivalent of
1	Precise Multimeter	2	No.	311-EL-01A/B	Fluke
2	Leakage Clamp meter	1	No.	311-EL-02	Motwane
3	Analog Clamp Meter DC	1	No.	311-EL-03	Hioki, Kew Snap(Kyoritsu Electrical Kew Snap)
4	Analog Clamp meter AC	1	No.	311-EL-04	Hioki, Kew Snap(Kyoritsu Electrical Kew Snap)
5	Digital Micro ohm meter	2	No.	311-EL-05A/B	NDB technologies, Canada make DRM-10 A
6	Micro Ohm meter	4	No.	311-EL-06A/B/C/D	Ductor, Fluke, Meco
7	LCRQ meter	1	No.	311-EL-07	Fluke, Hoiki, Hitachi, Aplab
8	Decade Resistance Box	2	No.	311-EL-08A/B	Vaiseshika Electron Devices Ambala Cantt
9	3 Phase Energy Meter Phantom Load Test Set	1	No.	311-EL-11	Megger, Landis & GYR, Supreme Instruments
10	1 Phase Energy Meter Test Set	1	No.	311-EL-12	Megger, Landis & GYR, Supreme Instruments
11	Primary Injection Test Kit	1	No.	311-EL-13	Megger, Technology Product, Delta Electric Corp, Thane, Rectifiers & Electronics pvt ltd
12	Secondary Injection Test Set	3	No.	311-EL-14A/B/C	Megger, Technology Product

13	Oil Filtration Machine	1	No.	311-EL-15	A.R. Engineering, Sapthagiri Industries
14	Motorised Oil Test Set	1	No.	311-EL-16	Zaran, Rectifiers & Electronics
15	3 PHASE Motor No Load test Run Facility	1	No.	311-EL-17	M/S AE Ltd Bombay
16	Cable Fault Locator	1	No.	311-EL-18	Megger
17	Auto Transformer	5	No.	311-EL-19A-I	Automatic Electric Ltd
18	Primary Injection Test Bench	1	No.	311-EL-20	Rectifiers & Electronics
19	70 KV DC Hipot Test Set	1	No.	311-EL-21	Biddle 220070, Megger
20	Non- Contact High Volatage Detector	2	No.	311-EL-22A/B	Motwane, Technology
21	Circuit Breaker Operation Analyser	2	No.	311-EL-23A/B	Megger, Hioki, SCOPE TMT
22	Vacumm Test Kit for Testing VCB	2	No.	311-EL-24A/B	Megger, Technology Product, Rectifiers & Electronics
23	Partial Discharge Test Set	1	No.	311-EL-25	Megger, Technology Product
24	70 KV AC Hipot Test Set	1	No.	311-EL-26	Biddle, Megger, Doble, Rectifers & Electronics
25	3 Phase Power Analyser	1	No.	311-EL-27	Megger, TES, Fluke, Hioki. Atandra
26	Capacitance and Tan Delta Set	1	No.	311-EL-28	Udey; Siva Instruments
27	Very Low Frequency Hipot Set	1	No.	311-EL-29	Udeyraj Electricals Pvt Ltd
28	Battery Charge Discharge Set	1	No.	311-EL-30	Eagle (for discharge set)
29	Cable Route Tracer	1	No.	311-EL-31	Megger,Fluke, Telemetric
30	Battery Health / Capacity Checker	1	No.	311-EL-32	MECO
31	Sound Level Meter	2	No.	311-EL-34A/B	Rion
32	Non-Contact Tachometer	2	No.	311-EL-37A/B	Testo
33	Regulated DC Power Supply	4	No.	311-EL-38A/B	Fluke, Hoiki, Hitachi, Aplab
34	HAND Operated CRIMPING TOOLS with Die sets		No.		Jainson
a	Die Set from 0.5mm ² to 16mm ²	4	No.	311-EL-CR-16A/B/C	
b	Die Set from 16mm ² to 50mm ²	3	No.	311-EL-CR-50A/B/C	
c	Die Set from 0.5mm ² to 6mm ²	4	No.	311-EL-CR-6A/B/C/D	
d	Die Set from 10mm ² to 185mm ²	3	No.	311-EL-CR-185A/B/C	
e	Die Set from 25mm ² to 400mm ²	3	No.	311-EL-CR-400A/B/C	
35	Transformer Test Kit	1	No.		Trax

36	5 KV Motorised Megger	4	No.		Waco
37	Rheostat a. 10A b. 20A	3 nos each	No.		Global electricals
38	3 Phase Primary injection set for 3000 Amp KV	1	No.		SMC
39	3 Phase Secondary injection set KV, A	1	No.		GFUVE, Omicron, L&T
40	Dissolve Gas Analysis Set with 10 SS bottles compatible for oil sample	1	No.		Kelman, Huazheng Electric
41	Oscilloscope	1	No.		Tektronix
42	3 Phase Voltage Recorders	1	No.		ElitePro
43	Frequency Generator	1	No.		
44	Dynamic Frequency Relay Test Set	1	No.		Megger
45	Calibrator	1	No.		Yokogawa
46	Decade Inductance Box	1	No.		IET Labs INC
47	Decade Capacitance Box	1	No.		IET Labs INC
48	Transistor test kit	1	No.		DUOYI
49	Truck with ladder	1	No.		Sai Siddhi Corporation
50	Alluminium Ladders				
a.	Technical specifications of 6 feet H Type Aluminum Alloy ladder	3	No.		Sai sidhi Corporation
b.	8 feet H type Aluminum Alloy ladder	3	No.		
c.	12 feet H type Aluminum Alloy ladder	2	No.		
d.	6 feet A type Aluminum Alloy ladder	4	No.		
e.	8 feet A type Aluminum Alloy ladder	4	No.		Sai sidhi Corporation
f.	12 feet A type Aluminum Alloy ladder	3	No.		
g.	6 feet Step type Aluminum Alloy ladder	2	No.		
h.	8 feet Step type Aluminum Alloy ladder	3	No.		
i.	40 feet SKY LIGHT Road Star Tower Type Aluminum Ladder to mount on Truck	1	No.		Sai sidhi Corporation

- a) Supply of Testing Set/ Equipment upto RFCL Electrical Work Shop, its initial power up and commissioning/ acceptance testing will be in the supplier scope for the items as applicable.
- b) Special tools and tackles (as required for each electrical equipment) shall be supplied as per equipment manufacturer recommendation
- c) Training to RFCL engineers shall be provided as detailed in the specifications.

2.2 Bidder's scope include procurement, supply and installation of all electrical workshop equipments covered under clause no. 2.1 and all other associated items not indicated here but required for completion of the system.

- 2.3 Supply of the technical literature, drawings and documentation for all the Testing Equipments along with offer is mandatory failing to which offer can not be evaluated.
- 2.4 Bidder shall visit the site for any clarification required
- 2.5 The bidder shall be completely responsible for the successful completion of the job.
- 2.6 Vendor shall provide special tools and tackles for maintenance, calibration etc. if any. The list of special tools and tackles considered shall be submitted along with the offer. The price of the same shall be included in the base price.
- 2.7 All electrical receptacles shall confirm to IS/BS standards.
- 2.8 Provenness Requirements:
The workshop equipments covered under clause no. 2.1, other bought out items and services as offered should have been supplied and working satisfactorily for a period of minimum 8000 hours on the date of issue of enquiry.
- 2.9 Certificate for Logistic Supports
- In case, of not being the manufacturer, bidder shall submit authorization letter from the manufacturer to quote its (manufacturer's) product for this project.
 - Bidder shall also furnish Performance Guarantee certificate from the manufacturer along with their offer with the bid document.
 - The offered workshop equipment's manufacturer shall have their own service centers / authorized service centers in India. Bidder shall provide the details and addresses of manufacturer's service centre in India.

3. DESIGN OBJECTIVES AND GUIDELINES

3.1 ENVIRONMENTAL SPECIFICATIONS

All the items covered in this MR shall be dispatched to RFCL, Telangana.

All equipment, test equipments, special tools and tackles shall be capable of maintaining the guaranteed performance with operational lifetime of 20 years minimum when operating continuously under the following environmental conditions:

- Operating Temperature:
For workshop equipments.
STORAGE: -10° C to +40° C
- Ambient Temperature (Max./Min.) 47.5 Deg C/ 8.4 Deg C
- Electromagnetic Compatibility Shall meet the requirements as per IEC 801 and other International standards. workshop equipment shall not have any electromagnetic interference with the electronics equipment installed at site, control room, SS, etc.
- Relative humidity 97.4%(max) to 11%(min)
- Rainfall 138.2mm in 24 Hr

3.2 SYSTEM GUIDELINES

3.2.1 Design Guidelines

- All equipment shall be immune to EMI, RFI interference generated by any nearby source & shall meet the latest international standards in this regard.
- All test equipments, special tools and tackles, shall be procured and supplied as a package with its carrying cases, accessories (interconnecting cables, connectors, lamps, batteries, fuses) from their respective manufacturer.
- Software, if any, to be used shall be provided with latest anti-virus protection software. All software should be license software and certificates for the same shall be provided. Certificate of calibration of all equipments shall be provided. Warranty cards for all equipments shall be provided and same shall be in the name of the RFCL.
- All equipments offered, shall conform to the relevant Indian /International Standards. All equipment shall be traceable to national / international testing laboratory.
- All equipments shall be supplied with carry case – portable units. Portable instrument shall have rugged carry case and rechargeable battery unit.

- f) Owner shall supply single point 415 V AC, 50Hz, TPN supply for the equipment. Any other necessary power supplies required by bidder for workshop equipments being supplied by bidder shall be generated from Owner's single point power supply. Supply & installation of power cables, power distribution Junction boxes and all necessary hardware consumables required for power distribution from single point supply for the equipment shall be done by bidder. Bidder shall terminate the cable in the Power distribution box (to be provided by the bidder).
- g) Any equipment requiring reliable power supply shall be provided with battery backup with minimum 30 minutes back up time.
- h) All equipment shall have their own regulated power supplies with fuses, isolators, etc.
- i) All equipment shall be provided with short circuit and over voltage protection.

4. WORKSHOP EQUIPMENT SPECIFICATIONS

Detailed specifications for the workshop equipments (as per list in clause 2.1) shall be as follows.

Bidder shall supply all required accessories with each electrical item listed below. These specifications are basic and minimum requirements to be followed by the bidder for selection of equipments. Higher version of equipment covering basic and minimum specifications are always Acceptable. Any specifications other than this shall be brought to purchaser notice for approval before procurement by the bidder:

Item 1 : Precise Multimeter

True RMS multimeter for highly accurate voltage, resistance, capacitance measurement. Similar to Fluke 287 multimeter. Detailed specifications / data shall be as per catalogue attached.

Item 2 : Leakage Clamp meter

AC DC Leakage clamp meter for measuring mA current. Similar to Motwane make DCM 600 Leakage Clamp meter. Detailed specifications / data shall be as per catalogue attached.

Item 3 : Analog Clamp meter DC

Highly accurate analog clamp meter for DC ampere of below mentioned individual ranges

- ii) 0-25Amp,600V and 2Mohm
- iii) 0-125 Amp,600V and 2Mohrn
- iv) 0-300 Amp, 600V and 2Mohm

Make Hioki, Kew Snap(Kyoritsu Electrical Kew Snap)

Jaw dia minimum 30 mm. have reading dial rotating feature for fixing the clamp in odd positions. Detailed specifications / data shall be as per catalogue attached.

Item 4 : Analog Clamp meter AC

Highly accurate analog clamp meter for AC ampere of below mentioned individual ranges

- i.0-25 Amp 600V and 2Mohm
- ii.0-125 Amp 600V and 2Mohm
- iii.0-300 Amp 600V and 2Mohm

Make Hioki, Kew Snap (Kyoritsu Electrical Kew Snap)

Jaw dia minimum 30 mm. have reading dial rotating feature for fixing the clamp in odd positions. Detailed specifications / Data shall be as per catalogue attached.

Item 5 : Digital Micro ohm meter

Highly accurate digital micro ohm meter, new generation, fully automatic, 4 terminal line loop contact resistance tester. Similar to NDB technologies, Canada make DRM-10 A Digital micro ohm meter. Detailed specifications / data shall be as per catalogue attached.

Item 6 : Micro Ohm meter

Analog 4 terminal line loop contact resistance tester micro ohm meter, current Range from 100 micro Amp to 10 Amp. For routine use. Exactly similar to Megger Low Resistance Ohm meter Ductor D007 model.

Detailed specs attached.

Make Ductor, fluke, Meco.

Item 7 : LCRQ Meter

Equivalent to Aplab make LCRQ meter Model 4912. Catalogue attached.

Makes acceptable Fluke, Hioki, Hitachi, Aplab.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Detailed specification as per catalogue attached.

Item 8 : Decade Resistance Box

High Stability Decade Mega ohm boxes with silver to silver alloy contact and of range

i. Total Resistance: 1111 Mohm

Similar to M/S Vaiseshika Electron Devices Ambala Cantt India, Model type 8400 Sr. No. 6036 consisting of variable resistances of range 0.1M ohm to 1M ohm, 1M ohm to 10 M ohm, 10 M ohm to 100 M ohm , 100 M ohm to 1000 M ohm

ii. Total Resistance: 111.111 K ohm

Similar to M/S Vaiseshika Electron Devices Ambala Cantt India, Model type 7400 Sr. No. 5418 consisting of variable resistances of range 0.01 ohm to 0.1 ohm ,0.1 ohm to 1 ohm,1 ohm to 10 ohm , 10 ohm to 100 ohm,100 ohm to 1000 ohm,1K ohm to 10 K ohm,10 K ohm to 100 K ohm.

Other details / data shall be as per catalogue attached.

Item 9 : 3 phase Energy Meter Phantom load Test Set

Phantom Load Test Set with input auto transformer (if required for voltage adjustment) and fixed in a plywood test bench along with all pre wired Test terminal for testing the energy meter. Require for testing 3 phase and 1phase electromechanical, static and digital energy meter
Standard Technical Specification attached.

Make Megger, Landis & Gyr, Supreme Instruments make.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope

Item 10 : 1 phase Energy Meter Test Set

Single phase meter test bench suitable for calibration & testing of AC Ammeters, AC Volt Meters, AC Single Phase Energy Meters, Power Factor Meters & Watt Meters.

Other Technical Specifications will be as per attached catalogue.

Make Megger, Landis &Gyr, Supreme Instruments make.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 11 : Primary Injection Test Set

3000 Amp,

input 230 V, 50 Hz,1-phase,

Current Output 0-3000 Amp@ 6V,

Burden 18 KVA,

Tapping 500 A /1000 A /1500 A /2000/3000 A,

Duty Cycle Continuous,

Output Coils: 4 coils of 500A,

Automated control with user interface & LCD Display.

Other Technical Specifications will be as per attached catalogue.

Acceptable make Megger, Technology Product, Delta Electric Corp, Thane, Rectifiers & Electronics pvt ltd.

Equipment shall be supplied with all cables. Length of cables for current injection must not be less than 20 meter. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope

Item 12 : Secondary Injection Test Set

Equivalent to Megger make SVERKER 750 Relay Test Unit. Detailed Datasheet will be as per attached catalogue. Acceptable make Megger, Technology Product. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 13 : Oil Filtration Machine

5000 Litre per Hour capacity, 440 V, 3 phase, 50 Hz, Portable Oil filtration machine having degasser, vacuum pump and heaters for oil filtration. This machine must have inbuilt motorized oil test set upto 60 KV test suitable for 240 V,50Hz,1- phase, 0-60 KV, 2KV/sec as per IS 8792/72 for testing oil break down voltage.

RFCL Site training to Electrical Engineer and operating staff will be in bidder's scope.

Preferred make for oil filtration machine shall be A.R,Engineering L-77, ADDI.MIDC Satara 415004; Saphthagiri Industries. Detailed data will be as per attached catalogue.

Item 14 : Motorised oil test set

Motorised oil test set upto 60 KV test suitable for 240 V, 50 Hz,1- phase,0-60 KV, 2KV/sec as per IS 8792/72 for testing oil break down voltage. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Zaran make, Zaran Trading Agency Post bag 6657 Bombay 400050; Rectifiers & Electronics.

Detailed Datasheet will be as per attached catalogue.

Item 15 : 3 phase Motor No Load test run Facility

Consist of autotransformer & Kiosk.

Specification of Auto Transformer

Continuously Adjustable Auto Transformer, 3 phase, oil cooled type, Current Rating 400 A Along with all accessories.

Input 1

415 V, 50 Hz, 3 Phase,

Output 1

0-415 V;

Input 2

415 V, 50 Hz, 3 Phase,

Output 2

0-470 V

These Auto Transformer must have Red Light indicator at the top which glows as the voltage increases from 0 V to 415 V.

Similar to M/S AE Ltd Bombay make oil cooled, 6T, 400 Amp Auto transformer. Details shall be as per attached catalogue.

Kiosk

3 Phase+ Neutral kiosk having Bus bar rated for 400 Amp and direct outgoing from bus bar via Fuses for motor testing.

5 no of 3 P + N outgoing are required of rating 1x 400 Amp, 1x 250 Amp, 2 x 125 Amp, 1x 63 Amp.

Detailed shall be as per attached catalogue.

Item 16 : Cable fault locator

For locating and pin pointing the faults in the underground cable of length from few meters to kilo meters.

Similar to Megger make PFL221500 Cable Fault locator.

Catalogue/datasheet shall be as per attached catalogue.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 17 : Auto Transformer

Single Phase

OPERATING VOLTAGE: For Single Phase - 240V AC, 50-60 Hz. 1Ph

CURRENT RATINGS : 20A 2nos; 35A 1 nos

Maximum Current	0.7	2	4	6	8	10	15	20	24	28	35	Amp
Continuous Current	0.6	1.8	3.8	5.4	6.5	9	11.5	16	22	22	32	Amp

OPERATING TEMP: 0 deg- 50 deg C

- INSULATION RESISTANCE: >5Mohm at 500V DC.
- DIELECTRIC TEST: 2.5kV RMS for 1minute.
- STORAGE TEMP.: -9°C to 70 degC
- HUMIDITY: Up to 95% RH
- CONFORMS TO: I.S. 5142.
- Portable (P) with sheet steel enclosure for floor / table mounting.
- Along with all accessories

Notes: 1) As output voltage is continuously variable, Dimmerstats are rated in terms of current that can be drawn from the output

Three Phase Auto Transformer

Three Phase

OPERATING VOLTAGE: For Three Phase- 415V AC, 50-60 Hz.3 Ph- 4wire. Current rating: 40 A, and 100 A 1 nos each.

Other all specifications remain common.

Make Automatic Electric Ltd

Detailed specifications / data shall be as per attached catalogue.

Item 18 : Primary Injection Test Bench

Primary Injection Test Bench for testing LT motor thermal overload relay, complete in all respect like variable current injection source timer and contactor arrangement, Ammeter and along with all accessories.

Acceptable make Rectifiers & Electronics.

Detailed specifications / data shall be as per attached catalogue.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope

Item 19 : 70 KV DC Hipot Test Set

- Output: 70-kV DC
- Input Power: Nominal 120 VAC,50/60Hz
- Advanced performance with long-term reliability provided by filtered half-wave rectification
- Designed for maximum operator safety
- Operates like a Full-Wave Rectified Unit
- Complete Internal Guard Circuit/Guard, Connection on High-Voltage Output Cable
- Continuously Variable Test Voltage
- Fast Charging of High-Capacitance Samples
- Bipolar ammeter that displays the magnitude of the discharge current from the unit under test
- Input-supply-line circuit breaker
- Output current overload relay
- Zero-start interlock for high-voltage output
- Pushbutton controls and indicating lights for high-voltage ON/OFF
- Full circuit-breaker protection against internal damage by overloads, surges or test sample breakdown
- Connection for external permissive and safety interlocks
- Provides the most dependable, portable DC high voltage sources for checking the quality of electrical power cables, motors, switchgear, insulators, transformers and capacitors.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Similar to the Biddle 220070 High Voltage DC Dielectric Test Set and Megger make High Voltage DC Dielectric test set. Detailed specifications / data shall be as per attached catalogue.

Item 20 : Non-Contact High Voltage Detector

For detecting/ cross checking the panels cables before starting measurement. Voltage range 220 KV, 33 KV, 11 KV, 6.6 KV, 3.3 KV. Similar to Motwane make HV220 or Technology Products model TP-HT or TP-59. Detailed specifications / data shall be as per attached catalogue.

Item 21 : Circuit Breaker Operation Analyser

Circuit Breaker operation analyser suitable for ACB, VCB, SF6 circuit breaker of voltage level from 415 V to 220 KV. Similar to Scope TMT model HISAC Swift or HISAC Ultimo. Detailed specifications / data shall be as per attached catalogue. Makes acceptable: Megger, Hioki, SCOPE TMT. Softwares and Operating Laptop if required shall be supplied by bidder. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 22 : Vacuum Test Kit for testing VCB

Portable, microprocessor based equipment with in built 60 KV DC source and controllers to test bottles at high voltage, similar to Technology Product model VT-60. Detailed specifications / data shall be as per attached catalogue. Makes Megger, Technology Product, Rectifiers & Electronics. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 23 : Partial Discharge Test Set

Suitable for testing the Partial Discharges of 11KV Generators, 33KV, 11KV, 6.6 KV, 3.3KV, 415V Transformers and motors and 220 KV Switchgear. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Makes Megger, Technology Product and other reputed make. Catalogue/datasheet shall be as per attached catalogue.

Item 24 : 70 KV AC Hipot test set

Sturdy and Maintenance free, Leakage Milli ammeter has been provided on the earth side of H.V. Transformer.

Input: 240 V+/-10%,50 Hz 1ph

Output: 0 to 70 KV AC

Current Output: Selectable dual scale of 0-25mA and 0-50mA

Cooling: ONAN

Protection: Six type of protection making the set full proof.

1. MCB
2. Current limiting Resistor
3. '0' Interlock
4. Fuses
5. High Speed DC Tripping Relay
6. External Trip Contact {Test Area Interlock}

Indication: Neon lamps- MAINS ON, HT OFF, HT ON

Push Buttons: HT OFF, HT ON, PUSH to Read mA

Metering:KV Meter 0-70 KV AC, MilliAmmeter 0-25/50mA,Dual Scale Hot Mounted Type Timer 0-999 sec

Construction: Panel to be made from MS Sheet painted properly, have Castor wheels for free movement

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Make: Biddle, Megger, Doble, Rectifiers & Electronics.

Catalogue/datasheet shall be as per attached catalogue.

Detailed specifications / data shall be as per attached catalogue.

Item 25 : 3 Phase Power analyser

Suitable for measuring power from 1.1KW motor to highest rated 180KW 415 V motor for measuring active, reactive and apparent power, pf, Hz, harmonic distortion etc. Other features and accuracy and specs shall be as per attached catalogue

Makes like Megger, TES, Fluke, Hioki. Atandra are acceptable.

Detailed specifications / data shall be as per attached catalogue.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope

Item 26 : Capacitance and Tan Delta Set

Test Voltage 0.5 KV to 33 KV, Test Frequency 50Hz/60Hz.

Tan δ range: 0-100%, Resolution-0.001%

Voltage: 0-33kV

Current: 10 μ A-5A

Also displays the phase angle, frequency, watts loss, insulation power factor or tan delta, resistance (in the case of resistive specimens), inductance and quality factor (in the case of inductive specimens).

Test capacitance range @ 50 Hz / 60Hz

Internal power supply 200 mA max.

3pF-0.05 μ F @ 33kV

60pF-1 μ F @ 0.5kV

External power supply, 5A max.

3pF-1.25 μ F @ 33kV

Resolution: 0.001pF, 4 digits

Test voltage: 0.5-33 kV, user-selectable

The output test voltage tolerance of the CDF-6000 is +1% of the selected test voltage and remains stable along the duration of the test, un-affected by line or input voltage fluctuations.

Test current: 200 mA maximum

Capacitance: +1% of reading+ 1pF

Tan: +1% of reading +.00040

Voltage: +1% of reading.

Maximum output of 12 kV/200 mA

RS 232 interface

Can re-call stored 99 tests results.

Automatic calendar and time running.

Safety Features: High Voltage protection

Input Voltage protection

Grounded protection

No voltage overshoot

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Similar to Udey make Capacitance and Tan Delta Tester model CDF -6000; Siva Instruments. Detailed specifications / data shall be as per attached catalogue.

Item 27 : Very low frequency Hipot set

Having features like

- Programmable micro-controller
- Advanced digital frequency technology
- Built-in printer
- Portable
- Output AC Voltage 50KV

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Similar to Udeyraj Electricals Pvt Ltd Mumbai VLF Set Model VL-53. Detailed specifications / data shall be as per attached catalogue.

Item 28 : Battery Charge Discharge Set

Integrated Battery Charge Discharge Set with following main specification

Battery Charger Main specification

- Suitable for Lead Acid, Ni-Cd, Sealed Battery, VRLA Battery
- Suitable for battery size upto 500 Ampere hour
- Must have Constant Current, Constant Voltage Charge facility
- Must be suitable for charging battery in various voltage level i.e. preferably 30 V, 125 V, 250 V, 440 V

- Must be suitable for charging the battery at various current range upto 150Amp
- Must have float charger and Boost Charger
- Charger must not be modular type i.e. for eg 50 Amp x 3 modular charger for making 150 Amp rating
- Charger must be robust, have proper heat dissipation and sturdiness.

Battery Discharging Set Main specification

- Suitable for Lead Acid, Ni-Cd, Sealed Battery, VRLA Battery
- Suitable for battery size upto 500 Ampere hour
- Must have Constant Current discharge facility
- Must be suitable for discharging battery of 440V at 100 Amp rate

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Detailed specifications / data shall be as per attached catalogue.

Item 29 : Cable Route Tracer

Underground cable route tracing upto 15 KM. Input 240 V 50 Hz. Similar to Telemetric make CRT-50. Detailed specifications / data shall be as per attached catalogue.

Makes Megger, Fluke, Telemetric.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 30 : Battery Health/Capacity Checker

Capable of on line checking the health and capacity of industrial lead acid and nickel cadmium battery upto 500 AHR capacity. Similar to MECO make BM 63 Battery meter. Catalogue/datasheet shall be as per attached catalogue.

RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 31 : Sound level Meter

User Friendly sound level meter having Detailed specifications / data shall be as per attached catalogue.

Item 32 : Non-Contact Tachometer

- Easy one-hand operation
- Measurement of rpm, speeds and lengths
- Storage of mean, max. and min. values as well as the last measurement value
- Measurement distance up to 600 mm (optical measurement)
- Battery check "Low Batt"
- Robust design (protective case)

Detailed specifications / data shall be as per attached catalogue.

Item 33 : Regulated DC Power Supply

DC regulated power supply source for testing of relays and meter. Similar to the Aplab make L12815 model. In proper rack mounting and having over voltage protection. Detailed specifications / data shall be as per attached catalogue.

Makes acceptable Fluke, Hioki, Hitachi, Aplab.

Item 34 : Crimping Tools Alongwith all Crimping Die set accessories

1. Hand operated crimping tool complete with die set from 0.5 sqmm to 16 sqmm lugs similar to M/S Jainson make Smart 16
2. Hand operated crimping tool complete with die set from 16 sqmm to 50 sqmm lugs similar to M/S
3. Jainson Arjun 50.
4. Hand operated crimping tool complete with die set from 0.5 sqmm to 6 sqmm lugs similar to M/S Jainson make LUV-KUSH
5. Hand operated crimping tool complete with die set from 10 sqmm to 185 sqmm lugs similar to M/S Jainson Vishal (Hexagonal)
6. Hand operated crimping tool complete with die set from 25 sqmm to 400 sqmm lugs similar to M/S Jainson Surya 50

Detailed specifications / data shall be as per attached catalogue.

Item 35 : Transformer Test Kit

Transformer testing kit having capacity to windings, bushings, insulating oils, cellulose insulation, tap changers, core/tank insulation. Must be similar to Megger make TRAX Transformer Test Kit. Kit must be along with all accessories, leads, connectors, manuals. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. TRAX catalogue attached.

Item 36 : 5 KV Motorised Megger

5 KV motorised + hand operated analog megger having 2.5 KV and 5 KV selectable megger facility and FSD of 0-25 Gohm and 0-50 Gohm respectively. Kit must be along with all accessories, leads, connectors, manuals. Equivalent to Waco make WI2504HM model megger. Catalogue attached.

Item 37 : Rheostat

- Wire wound Sliding Rheostat wound with best quality Cu/Ni or Ni/Cr Alloy. Resistance Wire must have very low temp, Co-efficient and wire is protected with high temp, Resistance Compound. The winding must be done on vitreous enamelled drawn steel tube, fitted with aluminium die casted stands/fabricated steel stands. Phosphor Bronze or Self Lubricating Copper Graphite Contacts are fitted on Brass slider. Slides on Solid drawn brass rods.
- Rheostat contains Core Porcelain Tube, Non-Magnetic Non-Inductive Tubular Type. Diameter and Length of cores given in the table below
- Contact Block: Rheostat contains Squire piece made of material is fitted with contact sliders in the guide squire rod. Bright chrome plated Phosphor bronze strip which makes immediate contact with the guide rod. A backlit knob is fitted with squire piece for sliding up and down
Guide Rod: Rheostat Solid driven brass rod bright chrome plated squire
- Contact Material: Rheostat contains Multiple brushes of Phosphors bronze strip rolled strip give springy action to the contacts

Special features:

- Former – vitreous enamelled steel tube or vitreous ceramic.
- Slider – pressure die casted metal slider.
- End bracket – pressure die casted metal stand or steel fabricated stands.
- Wire – cupro-nickel alloy / nickel-chromium alloy having a negligible temperature co-efficient.
- Manganin wire wound rheostats on request.
- Slider knob made of Bakelite having good finger grip

Other detailed specifications / data shall be as per attached catalogue.

Item 38 : 3 Phase Primary injection set for 3000 Amp

3 phase primary injection set of rating 3000 Amp, having input power of 1-phase 230 V 50 Hz or 3-phase 440 V 50 Hz. Must be similar to TriRaptor Three-phase High Current Injection. Catalogue attached. Kit must be along with all accessories, leads, connectors, manuals. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 39 : 3 Phase Secondary injection set

Incoming supply voltage of 240 V 1 phase, Similar to TEST 330B Three Phase Secondary Current Injection Set GFUVE make or equivalent Omicron or L&T make. Catalogue attached. Kit must be along with all accessories, leads, connectors, manuals. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 40 : Dissolve Gas Analysis Set with 10 SS bottles compatible for oil sample

Capable of doing DGA Analysis of transformer oil and generate reports. Set must be supplied with 10 no SS suitable container/bottles for taking oil samples for DGA. Must be similar to Kelman Transport X model or Huazheng Electric make Dissolved Gas Analyser HZGC-1212. Kit must be along with all accessories, leads, connectors, manuals. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Catalogue attached.

Item 41 : Oscilloscope

Mixed Domain Oscilloscopes 100MHz to 1 GHz similar to MD03000. Kit must be along with all accessories, leads, connectors, manuals. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Catalogue attached.

Item 42 : 3 Phase Voltage Recorders

Capable for recording the single phase and three phase AC DC voltage, current, frequency power factor, watt. The recorder must record all the data in the form of waveform in real time and also have feature of recording the same real time waveform on paper. Similar to ElitePro XC Recording Power Meter.

Catalogue attached.

Item 43 : Frequency Generator

Channel dual

Frequency Output 25MHz

Sample Rate 125MS/s

Vertical Resolution 14 bits

Waveform: Standard Waveform Sine, Square, Pulse, Ramp, and Noise

Arbitrary Waveform: Exponential Rise, Exponential Fall, Sin(x)/x, Step Wave, and others, total 26 built-in waveforms, and other user-defined arbitrary waveforms

Frequency (resolution 32 bits)

Sine 1μHz - 25MHz

Square 1μHz - 5MHz

Pulse 1μHz - 5MHz

Ramp 1μHz - 1MHz

Noise 25MHz (-3dB) (typical)

Arb 1μHz - 10MHz

Amplitude: 1m Vpp - 10 Vpp (50Ω), 1m Vpp - 20 Vpp (high impedance)

Resolution 1m Vpp or 14 bits

DC Offset Range (AD+DC) ±5V (50Ω), ±10V (high impedance)

DC Offset Range Resolution 1mV

Load Impedance 50Ω (typical)

Arbitrary Waveform

Wave Length 2 pts to 8K pts

Sample Rate 125MS/s

Vertical Resolution 14 bits

Non-volatile Memory 26 waveforms

Modulation

Modulation Waveform AM, FM, PM, FSK, Sweep, and Burst

Modulation Frequency 2mHz to 20.00KHz (FSK 1μHz - 100KHz)

Counter

Function Frequency Period, +Width, -Width, +Duty, and -Duty

Frequency Range 100mHz - 200MHz

Frequency Resolution 6 digits/s

Input / Output

Display 3.9 inch (480 × 320 pixels) TFT LCD

Type

counter, external modulation input / output, external trigger input / output,

external reference clock input / output

Communication Interface USB host, USB device, RS232

Must be along with leather carrying case, leads and all the accessories. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Item 44 : Dynamic Frequency Relay Test Set

For Testing Volt/Hertz, Under voltage, Overvoltage, Auto synchronizing, Frequency. Must be similar to Megger Make FTS 1000 Dynamic Frequency Relay Test Set. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope.

Catalogue attached.

Item 45 : Calibrator

Power supply source 4 mA to 20 mA and calibrator similar to Yokogawa Handy Calibrator CA71. Along with all accessories. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Catalogue attached.

Item 46 : Decade Inductance Box

Substandard Inductance box 0.1mH to 1H. similar to IET Labs INC make Decade Inductance Box model CS 300 H. Along with all accessories. Catalogue attached.

Item 47 : Decade Capacitance Box

Substandard Capacitance box 0.1pF to 1000 pico Farad.similar to IET Labs INC make Decade Capacitance Box model LS 400 A. Along with all accessories. Catalogue attached.

Item 48 : Transistor test kit

The Digital Transistor DC Parameter Tester for testing the DC parameters of manifold semiconductors such as diode, transistor, controlled silicon and field effect transistor. Applications Measuring forward voltage, reverse voltage, forward saturation voltage drops, amplification factor, reverse leakage current of various crystal diode, silicon controlled rectifier(SCR), field effect transistor(FET). Along with all accessories. RFCL Site training to Electrical Engineer and operating staff will be in Bidder's scope. Similar to DUOYI make DY294 model transistor test kit.

Specifications:

Function	Range	Display Scope	Resolution	Operation Condition
DY294 $V_{(ER)}$:	1000V	0-1999V	1V	breakdown current < 1mA
	200V	0-199.9V	0.1V	breakdown current < 1mA
DY294 V_{CC} Set:	2A(I_c)	0-6.00V	0.01V	$I_c \approx 2000mA$ $I_e \approx 200mA$
	800mA(I_c)	0-6.00V	0.01V	$I_c \approx 600mA$ $I_e \approx 60mA$
	100mA(I_c)	0-6.00V	0.01V	$I_c \approx 100mA$ $I_e \approx 1mA$
	10mA(I_c)	0-6.00V	0.01V	$I_c \approx 10mA$ $I_e \approx 1mA$
β_{FE} of DY294	10mA(I_c)	0-199.9	0.1	$I_e \approx 10mA$
	1mA(I_c)	0-1999	1	$I_e \approx 1mA$ DY294
	1 μ A(I_c)	0-1999	1	$I_e \approx 0.01mA$
I_{CEO} of DY294	2000 μ A	0-1999 μ A	1 μ A	$V_{ce} \approx 27V$
78 79 three-pole constant voltage value	75xx/79xx	0-24.0V	0.1V	$U_i \approx 27V$

Product size: 150x100x70mm

DY294 Weight: About 555g

Item 49 : Truck with ladder

Mini truck with ladder. Ladder can be fixed with nut bolts on truck which can be dismantled as and when required. Truck similar to TATA 407.Ladder similar to Tilttable Tower Ladder Equivalent to or Similar to M/S Sai Siddhi Corporation, Pune make Tilttable Tower Ladder M. No. 512 Catalogue attached. Alongwith all accessories.

Item 50 : Alluminium Ladders**a. Technical specifications of 6 feet H Type Aluminum Alloy ladder**

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:19975
3	Preferable Height and Dimension	Straight 6ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

b. Technical Specification of 8 feet H Type Aluminium Alloy Lader

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975.
3	Preferable Height and Dimension	Straight 8ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

c. Technical Specification of 12 feet H Type Aluminium Alloy

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	Straight 12ft. having aluminium channel & Steps edging non-Slippery.

4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e. EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

d. Technical Specification of 6 feet A Type Aluminium Alloy Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	A Type ladder 6ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

e. Technical Specification of 8 feet A Type Aluminium Alloy Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	A Type Ladder 8ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

f. Technical Specification of 12 feet A Type Aluminium Alloy Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	A Type Ladder 12ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Loading capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

g. Technical Specification of 6 feet Step Type Aluminium Alloy Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	Step Type Ladder 6ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

h. Technical Specification of 8 feet Step Type Aluminium Alloy Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	Step Type Ladder 8ft. having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.

5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

i. Technical Specification of 40 feet SKY LIGHT Road Star TOWER Type Aluminium Ladder

S. No.	PARTICULAR	SPECIFICATION
1	Standard	AS PER IS 3696:1991(Part-2) with latest Amendments
2	Material	Aluminium alloy complying with the suitable grade of IS 617:1975
3	Preferable Height and Dimension	40 feet SKY LIGHT Road Star Tower Type Ladder having aluminium channel & Steps edging non-Slippery.
4	Class	Confirming to duty class relevant to be used in EHV Transmission system i.e EHV electrical substations including yard/line etc.
5	Loading capacity	The Load capacity should be as IS.
6	Locking And Spreader	A locking device or spreader to hold the front and back section securely in an open position and each pair of side –rails rigidly to one another shall be an integral part of each ladder.
7	Bottom	All the bottoms of the ladder must have rubber insulation pads

5. GENERAL

5.1 TRAINING

The bidder's quote shall include site training to RFCL personnel for those equipments for which requirement of training is mentioned in above listed items.

The course shall be conducted at site at a time to be mutually agreed with the successful Bidder at a later date.

It shall be explicitly understood, however, that Purchaser's personnel shall be fully associated during Engineering, Testing and commissioning activities and this opportunity shall be taken by bidder to impart on-the-job training in addition to the course mentioned above.

This course shall be conducted after the receipt of equipment at RFCL site.

The training course to be conducted at site, shall be mainly devoted to the operation of equipment, testing of equipment/sub-assembly, preventive breakdown, Trouble shooting and normal maintenance activities. The training imparted shall cover all aspects of each equipment used in the system.

Bidder shall provide comprehensive documentation, course material, manuals, literature etc. as required for proper training of personnel at his own cost. Consolidated and comprehensive documentation shall be available to each participant. After the completion of course, all such materials shall become the property of the RFCL. Bidder shall update the course material of manuals in case there are any changes owing to revisions/modifications in equipment/system specifications.

The training as detailed above shall be considered in the evaluation of the offer.

5.2 PACKING

All equipment shall be individually packed in suitable containers/crates designed to avoid damage to the equipment during transit and storage in accordance with best commercial practice and with the requirements of applicable specifications. The materials used for packaging, wrapping, sealing, moisture resistant barriers, corrosion preventers, etc. shall be of recognized brands and shall conform to best standards in the areas in which the articles are packaged. The packing shall protect the equipment from impact, vibration, rough handling, rain, dust, damp,

insects, rodents, etc. Each container/crate shall be subjected to impact, vibration and other mechanical tests. Each container shall be clearly marked with the following information at prominent places (provided as sample):

RFCL : M/s RFCL
PROJECT : Revival of Ramagundam Fertilizer Project
(ELECTRICAL WORKSHOP EQUIPMENT)
DESCRIPTION :
SERIAL NO. OF :
EQUIPMENT :
ADDRESS :

All equipment shall be tested for damage after their receipt at site by bidder as per RFQ. If any equipment, part, subsystem, component, accessory is found to be damaged during the transit, the same shall be replaced by the Bidder, free of all costs to the RFCL. The bidder shall replace such item as shall be found damaged by bidder or as indicated to bidder, within 30 days of receipt of intimation.

5.3 QUALITY ASSURANCE, TESTING AND COMMISSIONING

A) QUALITY ASSURANCE PROGRAM

Bidder shall submit the details of Quality Assurance Program followed by him beginning with raw materials, active, passive and fabricated components, units, sub-assemblies, assemblies, wiring, interconnections, structures etc. to finished product. Bidder shall obtain and forward the Quality Assurance Program for equipment supplied by Sub-vendor, if any.

The RFCL/EIL reserves the right to inspect and test equipment at all stages of production and commissioning of the system. The inspection and testing shall include but not be limited to raw materials, components, sub-assemblies, prototypes, produced units, guaranteed performance specifications, etc.

For Factory inspection and testing, Bidder shall arrange all that is required e.g., quality assurance personnel, space, test gear etc. for successful carrying out of the job by the RFCL/EIL, at Bidder's cost, at the Manufacturer's works.

RFCL/EIL shall have free entry and access to any and all parts of the Manufacturer's facilities associated with manufacturing and testing of the system at any given time.

It shall be explicitly understood that under no circumstances shall any approval of the RFCL/EIL relieve the Bidder of his responsibility for material, design, quality assurance and the guaranteed performance of the system and its constituents.

Bidder shall invite the RFCL & EIL, at least 40 days in advance, of the date at which system shall be ready for Inspection and Testing. All relevant documents and manuals, approved Engineering drawings, etc. shall be available with the RFCL/EIL well in advance of the start of Inspection and Testing.

RFCL or his representative shall, after completion of inspection and testing to their satisfaction, issue factory acceptance certificates to release the equipment for shipment. No equipment shall be shipped under any circumstances unless a factory acceptance certificate has been issued for it, unless agreed otherwise by RFCL/EIL.

B) TEST CATEGORIES, TESTING & COMMISSIONING

i) Test categories

The following tests (in the same sequence) shall be conducted for acceptance of the equipment and the system before final acceptance of the system:

- Site Acceptance testing (SAT)
 - Trial
- ii) These tests shall be carried out on all equipment supplied by Bidder
- iii) Bidder shall arrange all necessary test instruments, manpower, test-gear, accessories, etc.
- iv) All technical personnel assigned by Bidder shall be fully conversant with the system specifications and requirements. They shall have the specific capability to make the system operative quickly and efficiently and shall not interfere or be interfered by other concurrent testing, construction and commissioning activities in progress. They shall also have the capability to incorporate any minor modifications/suggestions put forward by RFCL/EIL.
- v) Power supply and any temporary commissioning facility including communication system required for installation/testing/commissioning of the workshop equipment, shall be arranged by the Bidder.

vi) **Test Plan**

Bidder shall submit to RFCL and PMC 'Test Plans' well in advance of commencement of actual testing in each of the above-mentioned test categories (refer clause i).

The plans shall include the following:

- System, Equipment functional and performance description (in short) and Tests to be conducted and purpose of test.
- Test procedures (including time schedule for the tests) and identification of test inputs details and desired test results.

vii) **Test Report**

The observations and test results obtained during various tests conducted shall be compiled and documented to produce Test Reports by Bidder. The Test Reports shall be given for each equipment/item and system as a whole. The report shall contain the following information to a minimum:

- Test results
- Comparison of test results with anticipated (as per specifications) test result as given in test plans and reasons for deviations if any.
- The data furnished shall prove convincingly that:
 - The system meets the Guaranteed performance objectives.
 - Mechanical and Electrical limits were not exceeded.
 - Failure profile of the equipment during the tests is well within the specified limits.

viii) **Failure of Components**

Till the system is accepted by the RFCL, a log of each and every failure of components shall be maintained. It shall give the date and time of failure, description of failed component, circuit, module, component designation, effect of failure of component on the system/equipment, cause of failure, date and time of repair, mean time to repair etc. Repair/modification done at any point of time at one site shall be carried out by bidder at all the sites. Detailed documentation for the same shall be submitted to RFCL for future reference.

If the malfunctions and/or failures of a unit/module/sub-system/ equipment repeat during a test, the test shall be terminated and Bidder shall replace the necessary component or module to correct the deficiency. Thereafter, the tests shall commence all over again from the start.

If after the replacement the equipment still fails to meet the specifications, Bidder shall replace the equipment with a new one and tests shall begin all over again. If a unit/subsystem/module has failed during the test, the test shall be suspended and restarted all over again only after the Bidder has placed the Equipment back into acceptable operation. RFCL's approval shall be obtained for any allowable logistics time required to replace the failed component/unit/module/sub-system.

C) FINAL ACCEPTANCE OF THE SYSTEM

Upon successful completion of the 'SAT and commissioning, any shortfalls when compared to the contract shall be made good by the Bidder.

5.4 INSTALLATION MATERIAL

Bidder's scope shall include supply of all installation materials and hardware required for proper installation of the equipment.

5.5 WARRANTY

The warranty and guarantee must be 18 months from the date of receipt of material or 12 months from the date of satisfactory operation checking/ commissioning whichever earlier.

6. LIST OF ATTACHMENTS

- i. Merged catalogues (containing detailed specifications for electrical equipments)
- ii. Vendor Data Requirements