

PROCUREMENT PROCEDURE OF CPRI (NON WORKS)

Revision No : 04  
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 Section : Formats  
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Section IV T - Technical Specification  
 CENTRAL POWER RESEARCH INSTITUTE, BENGALURU/BHOPAL Web: www.cpri.in, www.tendersteward.com/CPRI

Tender Enquiry No: CPRIHR20CDD01M658

Description of the Equipment/Goods/Services: TEST EQUIPMENT FOR CIRCUIT INTEGRITY TEST ON CABLES UNDER FIRE CONDITIONS AS PER BS 6387 - 2013, (CATEGORY C, W & Z), and Test Set up Assemblies for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV

Note : 1) The technical bid submitted in other than this format is liable to be rejected.

2) All blue fields are mandatorily to be filled in.

Name and address of the bidder		To be completed by the Bidder			
Quotation Number and Date					
Sl.No.	Technical Specifications/Parameters	Qty	Details of guaranteed technical parameters offered by the bidder	Guaranteed Technical Particulars (GTP)	Deviations from GTP
1	<b>Place where equipment to be supplied:</b> Cables Laboratory, Cables and Diagnostics Division, Central Power Research Institute, Bangalore <b>Scope (supply / supply &amp; installation / supply, installation &amp; training):</b> Supply, installation and commissioning TEST EQUIPMENT FOR CIRCUIT INTEGRITY TEST ON CABLES UNDER FIRE CONDITIONS AS PER BS 6387 - 2013, (CATEGORY C, W & Z), Resistance to Fire Alone (Category C), Resistance to Fire with water (Category W) & Resistance to Fire with mechanical shock (Category Z) and Test Set up Assemblies for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV as per IEC 60331-1 / 2018, IEC 60331-2 / 2018 & IEC 60331-3 / 2018. The system shall be commissioned at the laboratory of CPRI, Bangalore, by the Supplier. Necessary Logistics during commissioning and installation shall be arranged by the supplier. Training should be imparted for operating the equipment and controls of the system	1 No			
3	<b>GENERAL:</b> The test facility as per BS 6387 is used to check the resistance to fire of cables of rated voltage not exceeding 600/1000 V to maintain circuit integrity under fire conditions - Resistance to Fire Alone (Category C), Resistance to Fire with water (Category W) & Resistance to Fire with mechanical shock (Category Z). This test facility is also used to check the resistance to fire with mechanical shock for cables of rated voltage up to and including 0.6/1.0 kV as per IEC 60331-1 / 2018, IEC 60331-2 / 2018 & IEC 60331-3 / 2018.				
4	<b>TECHNICAL -- Common Requirements for all the standards.</b> <b>Circuit Continuity Checking &amp; Voltage withstand arrangement:</b> A three phase star-connected transformer or three single-phase transformers of Voltage Rating : 0 - 1200 Volts, 3 Amps, kVA Rating : 3.6 kVA for single phase transformer and 6.2 kVA for three phase transformer. The voltage should be adjustable through suitable 3 phase dimmerstat or 3 single phase dimmerstat. The output Voltage to be measured through suitable dividers. Display of Phase and Line output Voltage to be provided. Input Voltage : single Phase : 230 V, Three Phase : 440 V, Star Connection, Output Voltage : 1200 V, Star Connected 1.) Fuses : IEC 60269-3 : 2010 Fuse system A-D, Type BII, 2 Amps (Pink) or Circuit breakers with equivalent Characteristics. If Circuit breaker provided, additional fuse system also to be provided for verification on dispute. Fuse Box : 2 Amps Fuse box for 3 Phases and Neutral 2) Tripping System : Individual Tripping System for 3 Phases, Neutral and Earth 3) Control Unit : To facilitate to apply the required voltage and current and to display the voltage & current continuously throughout the testing. Temperature Display, Control unit shall have Flow meters for propane, LPG & Air in such a way the user can select either LPG or Propane & air to control the flame temperature, Timer to monitor 3 hours duration. 4) Current loading system : The system should be capable of driving a current of 0.25 A (approximately) through each core of 3 metres length of cable, the other end of the cable to be connected to lamp load (with balast resistor if necessary). It should be mounted on a panel with a provision for fixing the Load of series connected bulbs to indicate the line continuity for three phases, Neutral and Earth <b>Note: The above mentioned set up are common to Resistance to Fire Alone (Category C) of BS 6387, Resistance to Fire with water (Category W) of BS 6387, Resistance to Fire with mechanical shock (Category Z) of BS 6387 and Resistance to fire with mechanical shock for cables of rated voltage up to and including 0.6/1.0 kV as per IEC 60331-1 / 2018, IEC 60331-2 / 2018 &amp; IEC 60331-3 / 2018. Individual technical requirements for all the above tests as follows.</b>				

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Section IV 1 - Technical Specification

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			Details of guaranteed technical parameters offered by the bidder	Guaranteed Technical Particulars (GTP)	Deviations from GTP
5	<p><b>TECHNICAL -- Resistance to Fire Alone (BS-6387-Category C)</b></p> <p>1) <b>Cable Supporting System</b> : Shall have suitable end clamps with metallic stand and support to mount the cable horizontally. Five adjustable metal supporting rings with suitable clamps and fixture in such a way to adjust the spacing between the rings for mounting the cable. (i.e. At 300 mm and 150 mm apart)</p> <p>2) <b>Source of Heat /Burner</b>: Tube Type Gas Burner as per BS 6387 with a burner face length of 610 mm ± 10mm mounted on a suitable stand. Two numbers of Type K thermocouple of 1.5 mm diameter conforming to BS EN 60584-1 with suitable fixtures to mount the same at both the ends of the burner and parallel to the burner at a distance of 75 mm above it. The thermocouples are connected to the digital display of the temperature indicators mounted in the control panel. Temperature range -- Ambient to 1200 ° C and accuracy -- ± 2 ° C</p>				
6	<p><b>Resistance to Fire with Water (BS-6387-Category W) :</b></p> <p>1) <b>Test Rig</b> : A suitable water tank made up of stainless steel to accommodate the complete system consists of sample and burner assembly</p> <p>2) <b>Cable Supporting System</b>: The Cable is attached to metal support, of two metal strips consisting of 25 mm ± 1mm wide and 1150 mm ± 25 mm long and 5.5 mm ± 1 mm thick suitable copper clips shall be provided to clamp the metal strips with test sample at equal intervals of 200 mm ± 10 mm. This assembly to be supported on a suitable grounded test frame.</p> <p>3) <b>Water Sprinkler system</b> : A water sprinkler head shall be fixed to the test frame and positioned centrally with respect to the burner assembly at an appropriate distance from the test rig, to supply water at an approximately constant supply pressure sufficient to give a rate of water application in the vicinity of the cable sample between 0.25 L/m<sup>2</sup>/S and 0.3 L/m<sup>2</sup>/S. The rate of flow of water is measured by a water collection tray. Suitable automatic timer shall be provided for JET water applications. The water sprinkler head is as shown in Figure 1. (Refer Annexure - 1)</p> <p>4) <b>Water Collection Tray</b>: The water spary rate shall be measured using a collection tray 100 mm ± 5 mm wide and 400 mm ± 5 mm long and of sufficient depth to collect all the water and to calibrate the amount of water collected, the tray shall be placed centrally in the position the cable sample occupies.</p> <p>5) <b>Water Control Panel</b> : A separate panel with a suitable booster pump to be provided along with flow control and measuring system like flow meter, pressure gauge, regulating valve to control the flow of water to the water sprinkler system. The suitable range of the water flowmeter to be provided to give a rate of water application in the vicinity of the cable sample between 0.25 L/m<sup>2</sup>/S and 0.3 L/m<sup>2</sup>/S.</p> <p>6) <b>Source of Heat /Burner</b> : It shall comprise a ribbon type propane gas burner with a nominal burner face length of 500 mm with a venturi mixer (a centre-feed burner) and a nominal burner face width of 10 mm with three staggered rows of drilled holes, nominally 1.32 mm in diameter and drilled at 3.2 mm centres. Additionally a row of small holes shall be milled on each side of the burner plate to serve as pilot holes for keeping the flame burning. (As per Clause No. 7.1.5 of BS 6387) The temperature shall be measured using K-type thermocouple conforms to BS EN 60541-1. Temperature range -- Ambient to 1200 ° C and accuracy -- ± 2 ° C</p>				
7	<p><b>Resistance to Fire with mechanical shock (BS 6387-Category Z) :</b></p> <p>1) <b>Vertical Board</b>: A vertical board of heat resisting non-combustible material fastened rigidly to two horizontal steel runners, one at the top of the board and the other at the bottom. Vertical supports may also be provided. The board dimensions are                      Width of the board : 900 mm ± 10 mm, Length of the board : 300 mm ± 5 mm &amp; Depth of the board : 9 mm ± 0.5 mm                      Total Mass of the wall (Board + supporting frame) shall be 10 kg ± 0.5 kg. Each runner is made from 25 mm ± 1mm square steel tube of 1000 mm ± 1 mm length. The top runner shall be fastened to the board so that its upper face is flush with the upper edge of the board. Each runner shall have a horizontal hole drilled into it at each end outside the board suitably. The board shall be fastened to the framework by four bonded rubber bushes typically as shown in BS 6387: 2013 Figure.9 (Refer Annexure-2). Different diameter copper 'P' Clips to be provided to mount the sample onto the board.</p> <p>2) <b>Shock Producing Device</b> : Shall comprise a mild steel round bar 25 mm ± 0.1 mm in diameter and 600 mm ± 5 mm long, freely pivoted about an axis parallel to the board and 200 mm ± 5 mm away from the upper edge of the board. The axis of the bar shall divide the bar into two unequal sections of length 400 mm ± 5 mm and approximately 200 mm. The longer section impacting the steel runner at its mid point. Once every 30 s ± 2 s the bar drops under its own weight from an angle of 60 °. The whole operation should be fully automatic.</p> <p>3) <b>Source of Heat/Burner</b> : It shall comprise a ribbon type propane gas burner with a nominal burner face length of 500 mm with a venturi mixer (a centre-feed burner) and a nominal burner face width of 10 mm with three staggered rows of drilled holes, nominally 1.32 mm in diameter and drilled at 3.2 mm centres. Additionally a row of small holes shall be milled on each side of the burner plate to serve as pilot holes for keeping the flame burning.  <b>Note: Since the source of heat as per BS 6387, Category W, BS 6387, Category Z, and IEC 60331-2 and IEC 60331-3 are same, only one common source of heat or burner can be supplied for all the categories.</b></p>				

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8	<p><b>Resistance to Fire with mechanical shock as per IEC 60331-1 for cables of Diameter exceeding 20 mm.</b></p> <p><b>1) Test Ladder:</b> The test ladder shall consist of steel frame work and four adjustable central vertical element in order to accommodate different sizes of cable under test. The dimensions shall be 1200 mm ± 100 mm long, 600 mm ± 50 mm high. The mass of the ladder shall be 24 kg ± 1 kg. Ballast, if required shall be placed on steel supports. Angle iron approximately 45 mm wide and 6 mm thick, with suitable slots cut to allow for fixing of the bolts or saddles may be used for the construction of the ladder. Each horizontal element shall have a mounting hole not more than 200 mm from each end to mount the ladder to rigid support. The test ladder shall be fastened to a rigid support by four bonded rubber bushes of hardness 50-60 Shore. The bonded rubber bush shall be of 20 to 30 mm in thickness and 30 to 40 mm wide, with suitable bolts to support rigid upper ladder. Suitable provision to be provided to mount the sample to upper horizontal element of the ladder with U-bolts. P-clips made of metal strip (20 ± 2) mm wide and (30 ± 3) mm wide to support on vertical elements</p> <p><b>2) Burner:</b> Ribbon type propane gas burner with a nominal burner face length of 500 mm with a venturi mixer. The nominal burner face width shall be 10 mm. The face of the burner shall have three staggered rows of drilled holes, nominally 1.32 mm in diameter and drilled at centres 3.2 mm from one another. Mass flowmeter shall be provided to measure the flow rate of Propane and Air (320 ± 13) mg/s &amp; Air flow: (3270 ± 163) mg/s.</p> <p><b>Burner &amp; Control system verification:</b> Flame temperature is measured using two 1.5 mm mineral insulated stainless steel sheathed thermocouples type 'K' in accordance with IEC 60548-1 mounted on test wall made of heat-resistant, non-combustible and non-metallic material of length (900 ± 100) mm, height (300 ± 50) mm and (10 ± 2) mm thick. The thermocouple tips shall be 20 mm ± 1 mm in front of the test wall. The horizontal line of the Thermocouple shall be 100 ± 10 mm above the bottom of the wall.                      Temperature range -- Ambient to 1200 °C and accuracy -- ± 2 °C                      (Refer Annex A of IEC 60331-1-2018 which is attached)</p> <p><b>3) Shock Producing Device:</b> Shall comprise a mild steel round bar 25 mm ± 0.1 mm in diameter and 600 mm ± 5 mm long, freely pivoted about an axis parallel to the board and 200 mm ± 5 mm away from the upper edge of the board. The axis of the bar shall divide the bar into two unequal sections of length 400 mm ± 5 mm and approximately 200 mm. The longer section impacting the steel runner at its mid point. The bar shall drop from an angle of 60 ± 5 ° and the impact to be applied after 5 min ± 10secs from activation and subsequently at 5 min ± 10secs interval. The impacting bar to be raised from test ladder within 20 secs.</p> <p><b>4) Position of Heat Source:</b> The burner face shall be positioned in the test chamber above 200 mm from the floor 500 mm from any chamber wall. The burner should be rigidly fixed to the frame work during testing after due adjustment so as to prevent movement relative to the test specimen.</p> <p><b>Note: Since the source of heat as per BS 6387, Category W, BS 6387, Category Z and IEC 60331-1, IEC 60331-2 &amp; IEC 60331-3 are same, only one common source.</b></p>				
9	<p><b>Resistance to Fire with mechanical shock as per IEC 60331-2 for cables of Diameter not exceeding 20 mm.</b></p> <p><b>1) Test Wall and Mounting:</b> The test wall shall consist of a board of heat-resistant, non-combustible and non-metallic material fastened rigidly to two horizontal steel supports, one at the top of the board and the other at the bottom. Vertical supports may also be used. The dimension of the board shall be (900 ± 100) mm in length, (300 ± 50) mm in height and (10 ± 2) mm thick and the total mass of the test wall shall be (10.0 ± 0.5) kg. Ballast, if required, shall be placed on the steel supports. The horizontal support shall have a mounting hole at each end not more than 100 mm from the edge of the board, The test wall shall be fastened to a rigid support by four bonded rubber bushes of hardness 50 to 60 Shore A. 'P' metal clips of 10x1 mm wide shall support the specimen. Static deflection to be checked by application of mass to the centre of upper support of the wall. Mass : 25 ± 0.2 kg; Deflection : 1.5 ± 0.3 mm</p> <p><b>2) Flow meters and Flow Rates:</b> Mass flow meters or controllers shall be provided for controlling accurately the flow of fuel and air to burner. Propane flow: (160 ± 6) mg/s &amp; Air flow: (1600 ± 80) mg/s</p> <p><b>3) Burner &amp; Control system verification:</b> Same as IEC 60331-1 except for the tip shall be 10 ± 0.5 mm in front of the test wall</p>				

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10	<p><b>Resistance to Fire with mechanical shock as per IEC 60331-3 for cables of Diameter not exceeding 20 mm in metal enclosures:</b></p> <p>1) <b>Test Equipment</b> : Test equipment consists of metal enclosure, test ladder, shock producer, Source of heat, Thermocouple for verification, Continuity checking arrangement</p> <p>2) <b>Metal Enclosure</b> : The metal enclosure shall be of straight stainless steel tube of circular cross section of length 1300 mm ± 50mm. The tubes shall of size 20 mm with wall thickness of 1.6 ± 0.15 mm of ISI grades 304 &amp; 316 may be suitable.</p> <p>3) <b>Test Ladder &amp; Mounting</b> : The test ladder shall be of steel framework of length (1200 ± 100) mm, height (600 ± 50) mm with vertical elements at (400 ± 20) mm spacing. The total mass of the test ladder shall be (18 ± 1) kg. Ballast, if required, shall be placed on the steel supports. The metal enclosure to be rigidly mounted centrally on the test ladder, suitably sized U- bolts shall be provided for fixing on vertical elements. Each horizontal elements of frame shall be provided with mounting holes not more than 700 mm from each end. This test ladder is fastened to steel support by four horizontal rubber bushes of hardness 50 to 60 shore.</p>				
11	<p><b>Input Power Supply</b> : The apparatus shall operate on Input Supply Power supply of 220V +/- 10% AC, Frequency 50 Hz +/- 3%. ON/OFF switch and supply lamps indicator shall be provided</p>				
12	<p>• TEMPERATURE                  ---- Operation : 10°C to +40 °C                  ---- Relative humidity: Typical prevailing ambient humidity 30 to 85 % (non-condensing)</p>				
13	<p><b>Essential Spares:</b>                  per BS 6387, Category C - 01 No Burner as per BS 6387, Category W &amp; IEC 60331 - 01 no system : 01 no                  Burner as Thermocouple for Water sprinkler</p>				
14	<p><b>Calibration</b> : The voltage, current &amp; temperature display module along with thermocouple shall be calibrated from ISO 17025 accredited laboratories. Timers, Water measuring equipment, angle &amp; mass of the equipment shall be calibrated. The mass flow meters or controllers of propane and air measurement shall be calibrated from ISO 17025 accredited laboratories. The calibration certificates shall contain the information of uncertainty calculations and certificate traceable to international standards shall be supplied along with the instrument as per relevant standard.</p>				
15	<p><b>Manuals</b> : Relevant manuals/documents for operation and maintenance                  Two sets in English to be supplied (Hard copy)                  • Operation and maintenance                  • Drawings                  • Electrical / instrumentation                  • Technical / Service manuals along with circuit diagrams</p>				
16	<p><b>Pre-dispatch inspection &amp; Testing</b> shall be as follows:                  • Complete Operation of the Equipment                  • Demo of operation of software and calculation                  The pre dispatch inspection charges including travel, boarding and lodging shall be borne by CPRI</p>				
17	<p><b>Acceptance tests at CPRI laboratory</b> : The supplier should demonstrate all the tests with actual cable samples mounted at CPRI, Bangalore, such as burner temperature measurement, water sprinkler, mechanical deflection of shock producing device</p>				
18	<p><b>WARRANTY</b> : 2 years warranty from the date of installation &amp; commissioning of the system</p>				
19	<p><b>After Sales Service</b> : To be provided by local authorized agents for repair and maintenance in case of instrument breakdown or technical problems</p>				

PN- 1) Mere statement of "Complier" do not suffice the requirement. The details of technical parameters in proof of CPRI requirements shall be furnished along with technical write-up, catalogues, brochures, literatures, pamphlets, or any other documents shall be submitted in hard copy along with technical bid.  
 2) Calibration reports/certificates, factory test reports/certificates from an accredited agencies/facilities shall be submitted wherever applicable.  
 3) CPRI reserves the right to conduct "pre-dispatch inspection" prior to dispatch at the works of the supplier and the expenditure towards PDI shall be borne by CPRI. However information regarding the readiness of the equipment/machinery for the PDI shall be communicated in writing at least 70 days in advance.