



Tender No: IPR/TN/PUR/TPT/ET/18-19/4 DATED 7/5/2018

Section-C

Page 1 of 19

Technical Specification for Design, Engineering, Assembly, Factory Acceptance
Testing, Supply, Delivery, Installation and Site Acceptance Testing of
500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

TECHNICAL SPECIFICATION

FOR

500 kV, 100 mA, 50 kW DC OIL COOLED RESISTIVE LOAD BANK



INSTITUTE FOR PLASMA RESEARCH

BHAT, GANDHINAGAR – 382 428

GUJARAT, INDIA



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

TABLE OF CONTENT

1. Scope of Supply.....	3
2. Scope of Work.....	3
3. Application Description.....	3
4. Technical Specifications.....	4
5. Technical Requirements.....	5
6. Acceptance Tests.....	8
7. Contract Management.....	9
Annexure-I: 500kV, 100 mA DC Load Bank Conceptual Design Drawings.....	13
Annexure-II: Technical Bid Compliance.....	18



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

1. SCOPE OF SUPPLY:

The scope of work as defined in this tender document including annexures covers Design, Engineering, Assembly, Factory Acceptance Testing, and Supply, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank at Institute for Plasma Research (IPR), Gandhinagar as per the detailed technical specification mentioned in this tender document.

2. SCOPE OF WORK

The scope of work includes, but not limited to, the following main tasks:

- a) Design of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank as per technical specifications specified in Section-4.
- b) Submission of detailed design documents including Quality Plan as mentioned in Section-7 for IPR's review and approval.
- c) Procurement and Assembly of electrical components viz. Non inductive Resistors, HV Feed-through/Anti corona ring assembly, End Terminations including Clamps & Connectors, HV Tank with fittings & accessories etc. as per technical specifications and as may be required for complete design and development of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank.
- d) Supply of required quantity of EHV grade insulating oil as per technical specifications.
- e) Supply of spares of all type as per technical specifications.
- f) Arrange the stage wise inspections as per agreed Quality Plan and implementation of modifications (if any).
- g) Perform the Factory Acceptance Tests (FAT) as per approved acceptance test procedure complying the specifications as specified in Section-6.1
- h) Upon receipt of dispatch clearance note from IPR, Pack and Deliver the Load Bank at IPR site as per Section-7.
- i) Installation of 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank (Refer Section-7).
- j) Perform the Site Acceptance Tests (SAT) as per Section-6.2.
- k) Provide operational and instruction manuals with full technical details. (Refer Section-7).
- l) Provide FAT and SAT reports with all tests results, to the IPR before final acceptance.
- m) Provide technical support as per warranty clause.

3. APPLICATION DESCRIPTION

A regulated 500 kV, 100 mA DC Power Supply system is being developed at IPR. This power supply system primarily comprises of a High Frequency Power Supply (HFPS) unit, high voltage (HV) step up transformer, and a symmetrical Cockcroft-Walton voltage multiplier (CW-Multiplier) unit. The 500 kV, 100 mA DC power supply shall supply high voltage power to a particle accelerator OR used to test the high voltage component for its insulation/dielectric strength. To fully test and characterize 500 kV, 100 mA DC Power



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

Supply system the Load Bank is required. A simplified block diagram showing the scheme of 500 kV, 100 mA DC Power Supply system is shown in Figure-1.

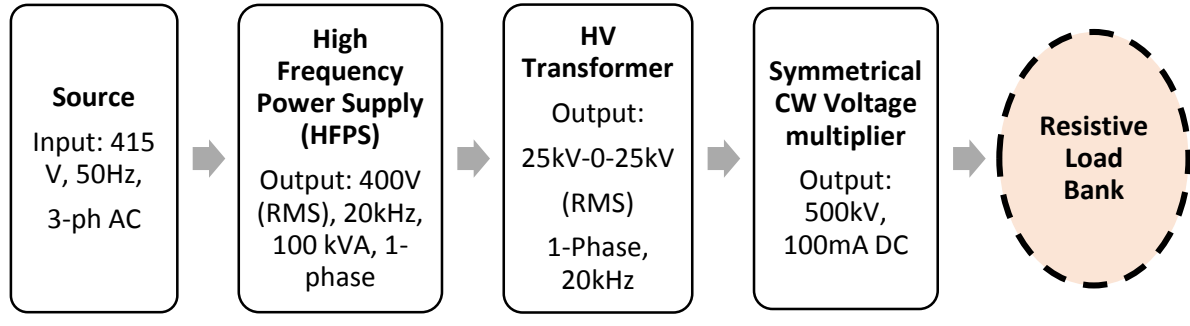


Figure 1: General Block Diagram of 500 kV, 100 mA DC Power Supply

4. TECHNICAL SPECIFICATIONS

The 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank shall be designed and manufactured/assembled as per technical specification defined in Table-1.

Table 1: Technical Specification of 500kV Resistive Load Bank

Sr. No.	PARAMETERS	IPR REQUIREMENT
1.	Application	To Test and Characterize 500 kV, 100 mA DC Power Supply at different voltage and current ratings
2.	Constructional	Modular for ease of obtaining the required voltage and current rating.
3.	Rated Voltage	500kV DC.
4.	Rated Current	100mA
5.	Rated Power	50 kW
6.	Current Selection at rated voltage	Tapping from 10 mA to 100 mA in step of 10 mA
7.	Resistance Value	5 MΩ ± 5%, at full load OR 50 MΩ ± 5%, at each tap (module)
8.	DC isolation from the HV terminal to grounded point	≥ 600 kV DC
9.	Operating duty cycle	10 Minutes ON, 1 Hour OFF.
10.	Site Ambient temperature	+15 °C to 50 °C
11.	Site Relative Humidity	10 % to 90%
12.	Temperature rise above ambient temperature	45 °C
13.	Temperature coefficient	Less than 500ppm/ °C
14.	Tolerance	Initial value ±5% or less
15.	Type of Resistor	Non inductive Resistors suitable for oil operation with metallic caps on the side
16.	Cooling	Oil natural air natural
17.	Insulating medium	EHV grade Mineral / Synthetic oil



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

18.	HV Tank material	High grade sheet metal or equivalent
19.	HV Termination	Through HV feed through/anti corona ring with metal links for different current selection (off load type).
20.	Installation	Indoor
21.	Accessories	a) Oil temperature indicator b) Oil level gauge c) Dehydrating Breather d) Pressure relief device e) Gas detection device f) Earthing rod- FRP rod with brass spade end and suitable length (5 meter) of flexible cable
22.	Applicable Standards	IEC 60060 Part-1 (1989) / IEC 60060 Part-2 (1994) and as applicable

5. TECHNICAL REQUIREMENTS

5.1. General:

- a) The HV Load bank shall be designed as per technical specification provided in this document.
- b) The HV load bank shall be made up of non-inductive resistor passive elements. Several of such resistive elements are connected in series / parallel combination to obtain the desire rating as specified in this specifications.
- c) The load bank shall be used for an integrated testing and characterization of 500 kV, 100 mA DC Power Supply system.
- d) The HV Load bank shall be designed for indoor installation.
- e) The HV load bank shall be designed to dissipate 50 kW power at 500 kV DC safely with a duty cycle of 10 Min ON/ 1 Hour OFF on regular basis.
- f) The HV Load bank shall have modular design for ease of operation & maintenance, and provisions for future expandability. The end connections/terminals of each module shall be brought out to facilitate appropriate series/parallel connection of modules to test 500 kV, 100 mA DC Power supply at different current rating in step of 10 mA as specified in the technical specification.
- g) The basic module of HV load bank shall be designed for 5 kW average power to draw a current of 10mA at rated voltage (500kV).
- h) Higher voltage rating shall be achieved by stacking multiple sub modules of lower voltage ratings in series on top of one another.
- i) The resistive elements of a single module shall be mounted on polycarbonate sheet or FRP (Grade G10 or equivalent) or suitable insulating material with supporting insulators. The inter stage electrical connections between sub modules shall be made with the help of high voltage connector/conductive link for a trouble free connectivity and for the ease in the assembly of the vertical stacking.
- j) The load bank resistive elements assembly shall be cooled and immersed in oil filled high voltage tank and the supply of required quantity of oil will be in bidder scope.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

- k) Spacers / post insulators shall be used to make the vertical structure of the HV load bank. The spacers /post insulators shall be of high dielectric strength to avoid any flash over in any region of the load bank.
- l) All the insulating material on which load bank components are mounted including spacers / post insulators shall be oil compatible and shall have enough mechanical strength to withstand the weight of the load bank components.
- m) The end terminals from each basic module shall be brought out from the tank using HV feed through/anti-corona flange of suitable diameter.
- n) Each module shall be pulled up by a motorized rope and pulley arrangement to make contact with output corona ring, thus load current can be selected in steps of 10 mA till full rated load of 100 mA, when all the modules have been pulled up to make connection with corona ring (HV output terminal).
- o) The HV load bank shall be designed with adequate clearances / creepage between all live and ground parts and between the two successive modules.
- p) The load bank shall be provide with safe and secured grounding arrangement firmly connected to the base of HV load bank.
- q) The load bank should have Locking type rotatable Wheels & Lifting Lugs to move from one place to another.
- r) The HV load bank shall be designed against all possible internal and external faults viz. over-voltage and internal arcing faults. Necessary passive protective elements viz., spark gaps of required rating shall be included in HV load bank assembly.
- s) Bidder shall ensure the assembly without any sharp metallic points or any sharp soldering joints or welding joints.
- t) Necessary fire and personnel safety guidelines/regulations for indoor installations as applicable shall be complied.
- u) The indicative / reference design and assembly drawings of 500 kV, 100 mA DC Load Bank with major ratings of the components are provided in Annexure I. Changes in this indicative / reference design and drawings may be possible based on bidder engineering development skills and availability of the required components in the market.

5.2. Selection of HV Resistors

- a) Resistor element used for constructing HV Load Bank shall be non-inductive metal oxide film type suitable for high voltage applications.
- b) Resistor element selected for series string of a basic module shall have enough wattage rating and voltage capability.
- c) Resistor element shall be physically arranged and mounted in such a way as to avoid any path for voltage break down while also allowing for the proper dissipation of heat.
- d) The resistor shall be non-inductive to observe the fast dynamics of the power supply output.
- e) Coating on the resistor element must be compatible to high temperature and moisture resistant.
- f) Resistor elements must be provided with smooth metallic caps/rings to avoid corona discharges.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

5.3. HV Tank

- a) The tank shall be made from good, commercial grade, low carbon steel as per design feasibility and shall be of welded construction.
- b) The HV tank shall be filled with EHV grade Mineral / Synthetic Oil
- c) The tank together with bushings and other fittings shall be designed to withstand without permanent distortion.
- d) The tank shall be designed to permit lifting by crane or jacks of the complete load bank assembly filled with oil. Suitable lugs and bolts shall be provided for this purpose.
- e) Bidder shall design the tank of suitable size which can enclose load bank resistor assembly with enough precautions in view of electrical insulation and a strong mechanical support to hold entire assembly and facilitate natural conductive/convective heat dissipation to air. There must be a provision of inlet and outlet with appropriate valves to connect to heat exchanger in future.
- f) The material used for the top cover of the HV tank shall have the provisions for easy connection and dis-connection of basic modules.
- g) The tank top/bottom shall be provided with a detachable cover with a bolted flanged gasket joint. The material used for gasket shall be cork neoprene or equivalent. The gasket joint for tank and other bolted attachments shall be so designed that the gasket will not be exposed to the weather and are not crushed.
- h) The tank top cover shall be of Reinforce Fibre Glass Plate with Polycarbonate seating or PEEK plate or metal sheet as per design feasibility.
- i) The tank shall be designed to fix the load bank assembly on top cover with suitable provisions for tanking/un-tanking the load bank assembly for maintenance or to repair/replacement of part/ component.
- j) The HV load bank basic module end termination/feed-through assembly shall be adequately fixed to the top/side tank cover and sealed in order to make it leak proof. Sealant shall be oil compatible and non-conductive.
- k) The body of the tank shall be thoroughly cleaned and should have a smooth surface. The body shall be painted with a poly-urethane (PU) anti tracking coat.
- l) Necessary measures shall be adopted like increased clearance / separate non-magnetic shields to minimize eddy current losses.
- m) Bidder shall provide safe and secured midpoint grounding arrangement firmly connected to the bottom of HV Tank or as per design feasibility.
- n) Bidder shall rest HV load bank on a trolley (base) with bi directional wheel with stopper arrangement.
- o) Resealing type pressure relief device as per standard shall be provided. The device shall operate below the test pressure of the tank.
- p) Oil temperature sensor/indicator as per standard with contacts for remote Alarm and Trip shall be provided.
- q) Necessary fittings and accessories/fixtures as suitable and appropriate viz. for oil draining, filling, sampling, oil level indicator, oil temperature sensor fixing, tank lifting, moving etc... shall be provided



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

- r) Terminal marking, rating name plate, danger sign and general HV Load Bank design scheme display shall be fitted on to tank body.

5.4. Spares

Following items shall be supplied as spares –

- a) Resistors of all type and ratings – 20% of actual quantity used
- b) Gaskets – 1 set
- c) Cables, clamps and connectors of all type and size – 20 % of actual quantity used
- d) Tank fittings & accessories – 1 number of each type
- e) Insulators and spacers of all type and ratings – 20 % of actual quantity used

5.5. List of preferred/recommended make of Components

S. No.	Description	Make
1.	HV Resistor	Nicrom/ Ohmite/ Vishay / Welwyn / International Resistive / Metallux / Kanthal/ Genvolt/ TT Electronics/ Caddock

6. ACCEPTANCE TESTING

6.1. Factory Acceptance Tests:

The 500 kV, 100 mA, 50 kW DC Load Bank shall be subjected to shop/factory acceptance test (FAT) as per HV Test Techniques derived from (A) IEC 60060 Part- 1 (1989) & (B) IEC 60060 Part- 2(1994) standards. All the tests shall be carried out at factory in the presence of IPR's representatives. The bidder shall have to prepare test reports and submit to IPR for his approval and acceptance after completion of tests. The tests result of any component or assembly if found unsatisfactory to the purchaser; the same shall be properly rectified and tested again to the satisfaction of the purchaser by the bidder at no extra cost.

The factory acceptance tests mentioned below shall be performed to the extent possible depending upon the availability of source either at bidder's factory OR at external government approved laboratory viz., CPRI, ERDA etc. The factory acceptance tests (FAT) to be performed by bidder are listed as follow;

- a) Visual & dimensional checks of 500 kV, 100 mA, 50 kW DC Load Bank (including its accessories and discrete components).
- b) Air pressure test on HV Tank.
- c) DC voltage withstand test (upto 120% or 600 kV) on each tap and on complete load bank assembly.
- d) Resistance measurement test at different voltage / current tapings and on complete load bank assembly.
- e) Auxiliaries and protection check.
- f) Review of test certificates for bought-out items including oil test certificate.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

6.2. Site Acceptance Tests:

The 500 kV DC Load Bank shall be subjected to site acceptance tests (SAT) at Purchaser's site by the bidder after completion of the installation work with an advance notice to the IPR. All the tests shall be carried out at site in the presence of IPR representatives. The bidder shall have to prepare test report and submit to IPR for his approval and acceptance after completion of tests. The tests result of any component and assembly if found unsatisfactory to the IPR; the same shall be properly rectified and tested again to the satisfaction of the Purchaser by the Bidder at no extra cost.

Site Acceptance Tests (SAT) are listed as follow,

- a) Visual inspection of the 500 kV DC Load Bank (including its accessories and discrete components) assembly.
- b) Physical dimensions of tank and oil leak check.
- c) Resistance Measurement test at different voltage / current tapings.
- d) DC voltage withstand test (upto 120% or 600 kV) on each tap and on complete load bank assembly.
- e) Full load test for duty cycle test for 24 hours (10 minutes ON/1 Hr. OFF) on complete load bank assembly
- f) Auxiliaries and protection check.

After the completion of SAT, the detailed test report including the test results shall be prepared by the supplier. The representative IPR and Supplier shall jointly sign the SAT test reports.

7. CONTRACT MANAGEMENT

7.1. Contract Execution Schedule:

The required delivery schedule for all the deliverables is *on or before 8 months from the date of approval of the design and drawings submitted by the bidder after the award of contract.* A preliminary contract execution schedule which meets the overall delivery duration with major activities and milestones shall be submitted along with the bid. However, the bidder should submit a detailed project execution schedule which meets the targeted delivery time after award of contract. This project execution schedule may include; design, component procurements, manufacturing, FAT, delivery milestone, installation and SAT etc.

7.2. Quality Assurance Plan (QAP):

The 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank shall be manufactured in conformance with the international and/or national standards/codes to assure the quality and reliability of the entire unit. Bidder shall prepare a QAP or a manufacturing inspection plan which ensures the operational quality of the deliverables items under this contract. The same shall be submitted to IPR of its review and approval. QAP shall provide details of



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

inspections/tests that will be carried out at various stages of the contract like design, engineering, procurements, manufacturing, assembly and testing.

7.3. Engineering Design Report (EDR):

After the award of contract, supplier should submit an Engineering Design Report (EDR) for 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank based on the technical proposal submitted during the bid for IPR approval. This report shall include following minimum submission documents (but not limited to) -

- a) Final Design reports including electrical, thermal and mechanical design, calculation of electrical power, voltage, resistor values, datasheet and sizing of components shall be submitted.
- b) Electrical schematic drawings of HV Load Bank.
- c) The detailed fabrication procedure and drawings of tank which shall include all the manufacturing details and tolerances.
- d) General arrangement drawings
- e) List of all accessories, hardware and bill of materials.
- f) Test Certificates and data sheets of all the bought-out major components viz. HV resistors, HV termination, HV connector, protection equipment, etc. used for development of HV Load Bank shall be provided.

7.4. Factory Acceptance Tests (FAT):

FAT shall be performed by the supplier to demonstrate compliance of the 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank as per contract specifications before effecting the shipment, as per Section-6.1.

7.5. Operating and Instruction Manual:

The supplier shall submit document / technical literature in form of hard copy and soft copy with complete layout, GA Drawings, detailed block diagrams and circuit diagrams of its assembly with test voltages at different test points of the unit. All aspects of installation, operation, maintenance and troubleshooting instructions as specified below shall be covered in this manual.

- a) Safety measures to be observed in handling of the equipment.
- b) Illustration of internal and external mechanical parts.
- c) Precautions at the time of installation, operation and maintenance.
- d) Procedures for trouble shooting, replacement and routine/preventive maintenance.
- e) Steps of remedial measures for troubleshooting the faults.
- f) Required Test Jigs and fixtures.
- g) Test instruments, test fixtures, accessories and tools required for maintenance and repair.
- h) List of replaceable parts used with the sources of procurement.
- i) A table giving details of sizes and dimensions of cable used
- j) Remedial steps for typical faults.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

7.6. Material Dispatch/Packing and Delivery:

After the review and approval of FAT report, a Dispatch Clearance Note shall be issued to supplier by IPR. All the deliverables (hardware and documents) shall be dispatched only after receiving a dispatch clearance note from IPR. However, a mere clearance issued by IPR will not relieve the supplier from the liability of proper functioning of 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank at IPR Laboratory.

Appropriate safe packing, transportation (including Insurance) to IPR site are under the scope of the supplier, which shall include (but not limited to) a necessary list of documentation and appropriate packing, markings, labelling for the deliverables items. It must be noted that IPR shall not be liable for any of the damages cause during transit of the deliverables. The detailed packaging and transportation scheme shall be submitted to IPR well in advance.

7.7. Site Description:

The laboratory/delivery site is located in the **Institute for Plasma Research Campus, Near Indira Bridge, Bhat, Gandhinagar – 382 428, Gujarat, India**. The laboratory, where 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank is to be installed is situated at ground floor level in IPR New Auxiliary Building.

7.8. Unloading and Storage:

Bidder is responsible for unloading of the 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank and accessories at proper locations at the site and verification of unit for damages and short supplies, making good all such damages and short supplies. The 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank and accessories shall be stored at Bidder's responsibility until final acceptance and taking over by IPR.

7.9. Installation:

Bidder is responsible for installation of 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank. Any material or accessory which may not have been specifically mentioned but which is necessary shall be supplied at no extra cost to IPR.

7.10. Site Acceptance Tests (SAT):

SAT shall be performed by the supplier to demonstrate compliance of 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank as per contract specifications after effecting the installation, as per Section-6.2.

7.11. Final Acceptance:

A final acceptance note shall be issued by IPR to the supplier after successful completion of SAT (and after resolving issues completely, if any) at site and submission of "As-built" marked-up drawings incorporating all modifications/changes made during manufacturing,



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

testing and installation of 500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank. The date of issuance of final acceptance note shall be considered as the date of final acceptance.

7.12. Warranty:

Supplier should provide a minimum of one year standard warranty for all the deliverables (500kV, 100 mA, 50kW DC Oil Cooled Resistive Load Bank and all its accessories) thereof from the date of final acceptance issued by IPR.

Additionally, an optional one year extended warranty from the date of expiry of above specified minimum warranty is to be quoted separately.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

Annexure - I

500 kV 100 mA DC LOAD BANK CONCEPTUAL DESIGN DRAWINGS

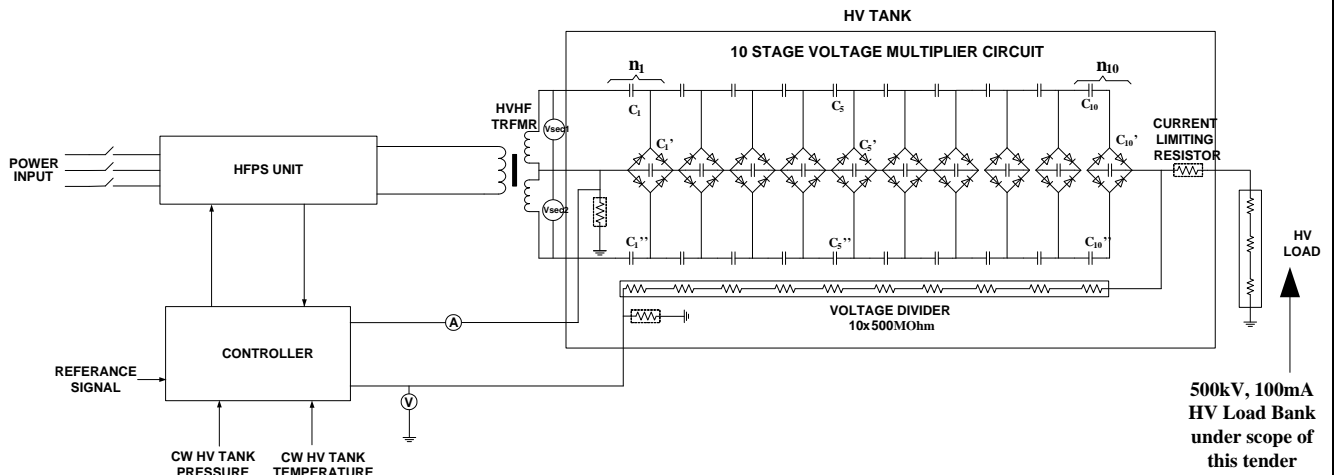


Figure 2: Electrical Schematic of 500 kV, 100 mA DC Power Supply

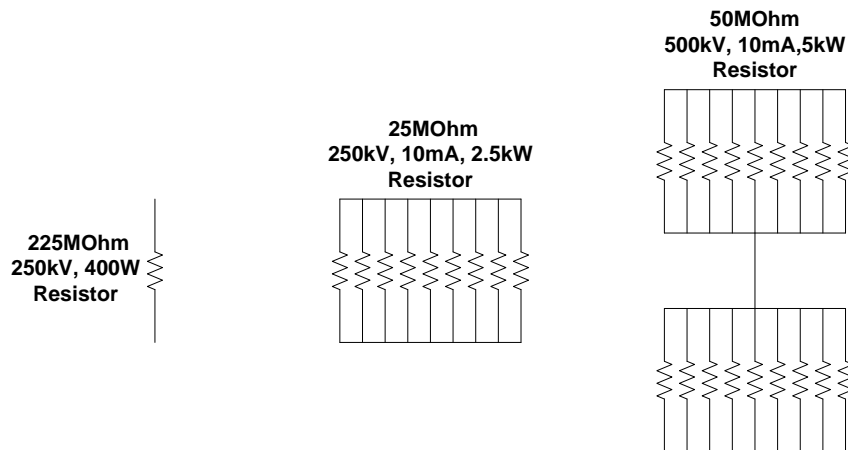


Figure 3: Circuit Diagram of 500 kV, 10 mA, 5 kW Basic Module of Load Bank



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

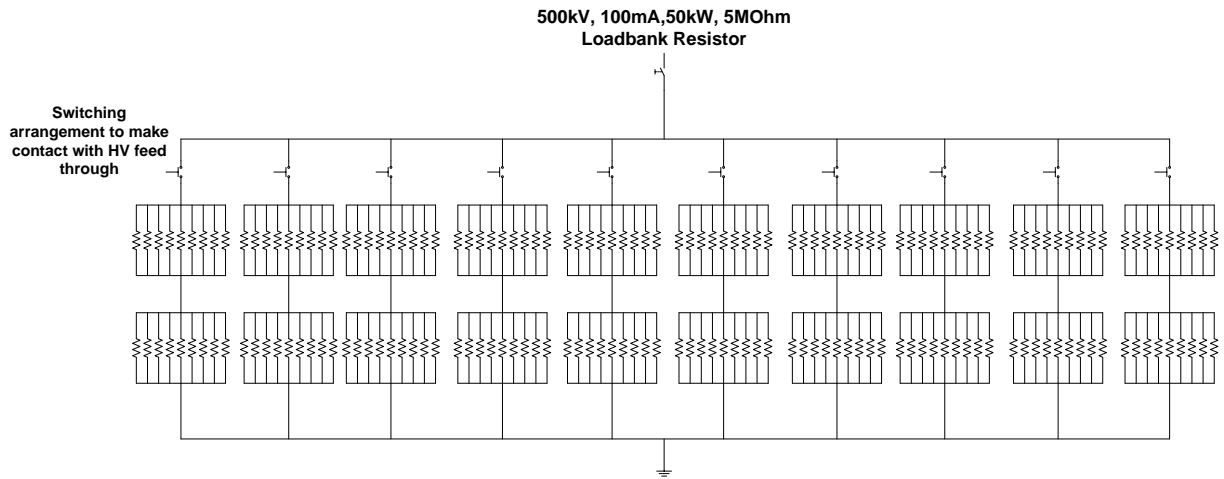


Figure 4: Circuit Diagram of 500 kV, 100 mA, 50 kW DC Load Bank with 10 Basic Modules in parallel.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

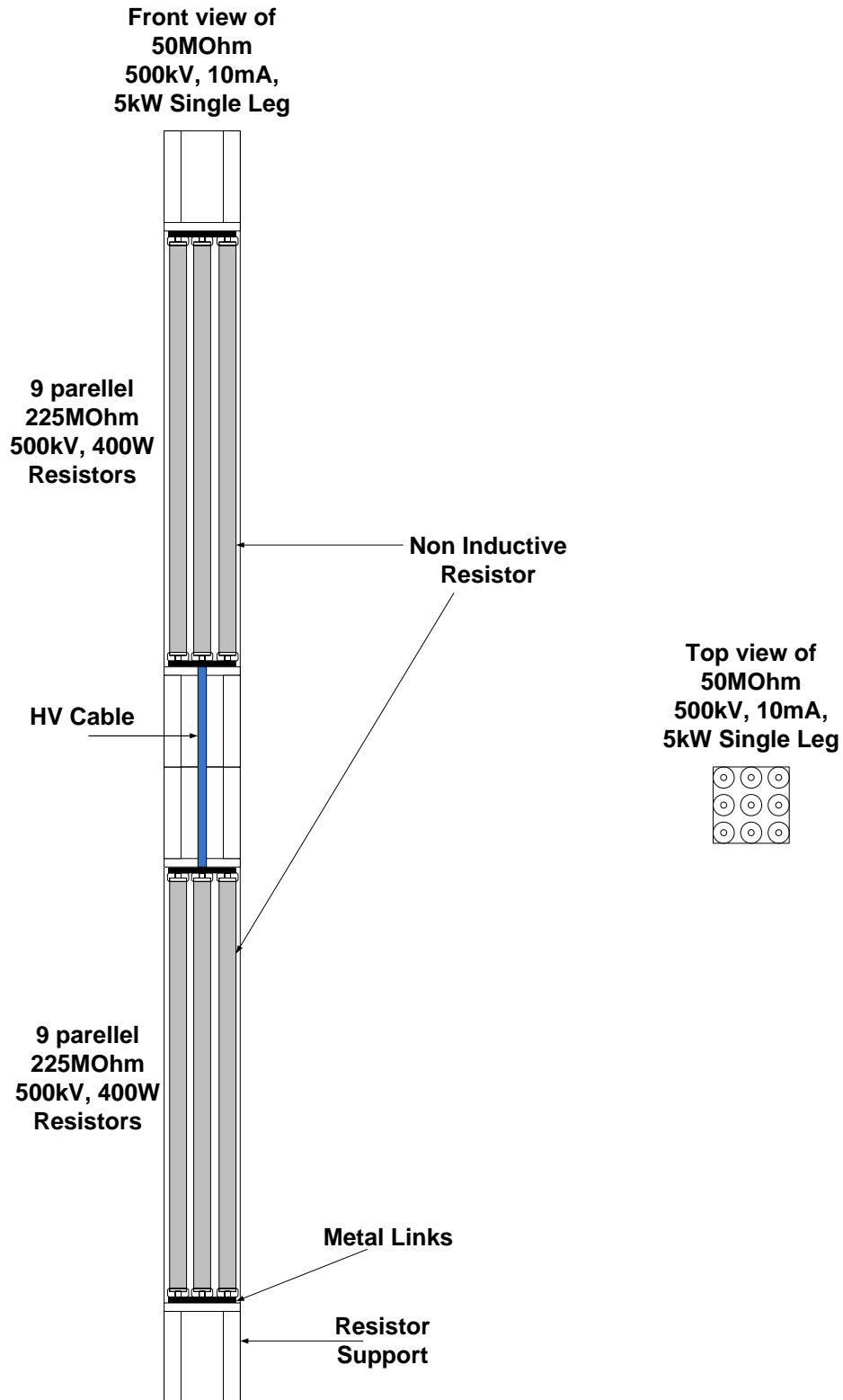
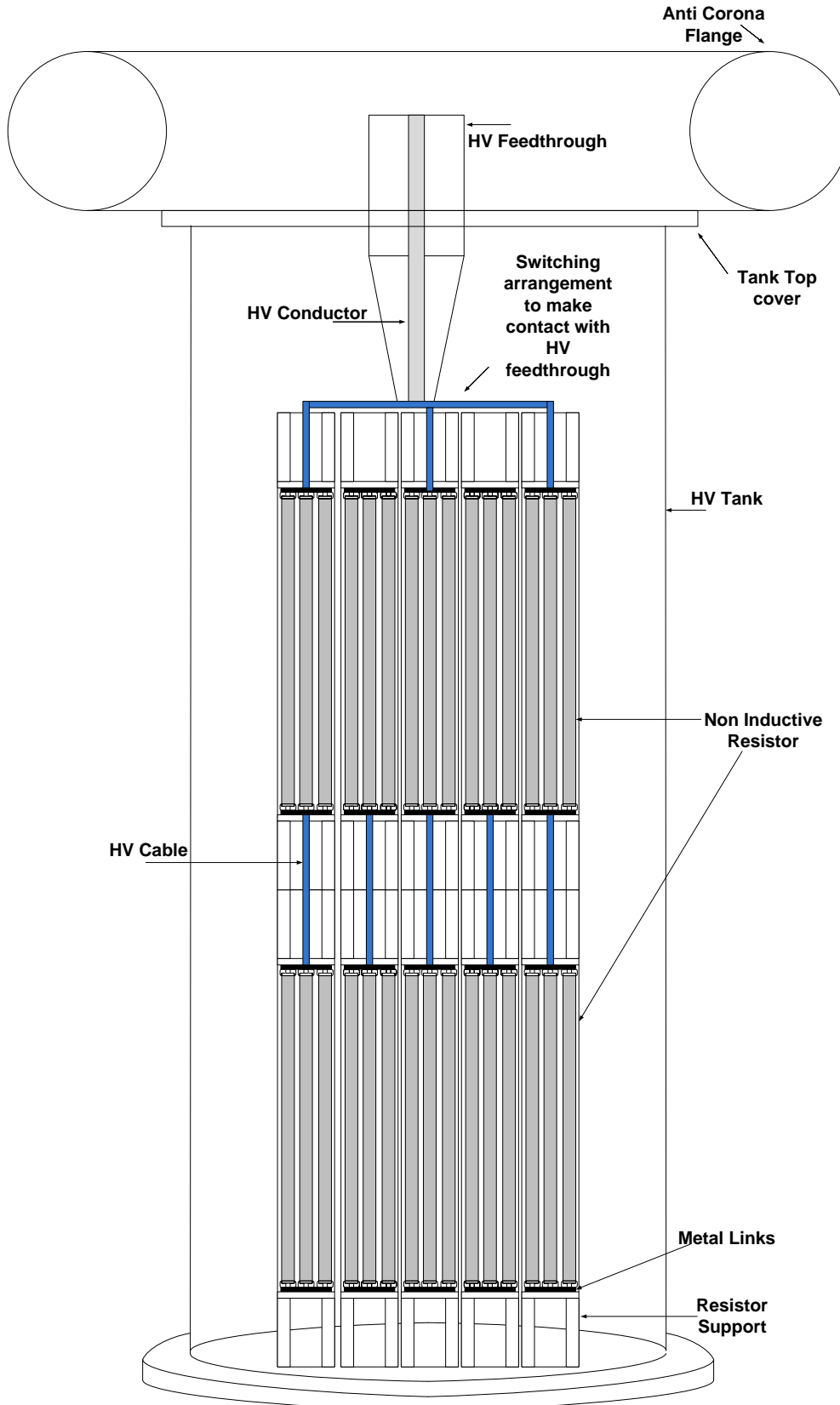


Figure 5: Sectional view of 500kV, 10mA Basic Module



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank





Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

Figure 6: Sectional view of 500kV, 100mA, 50kW Load Bank

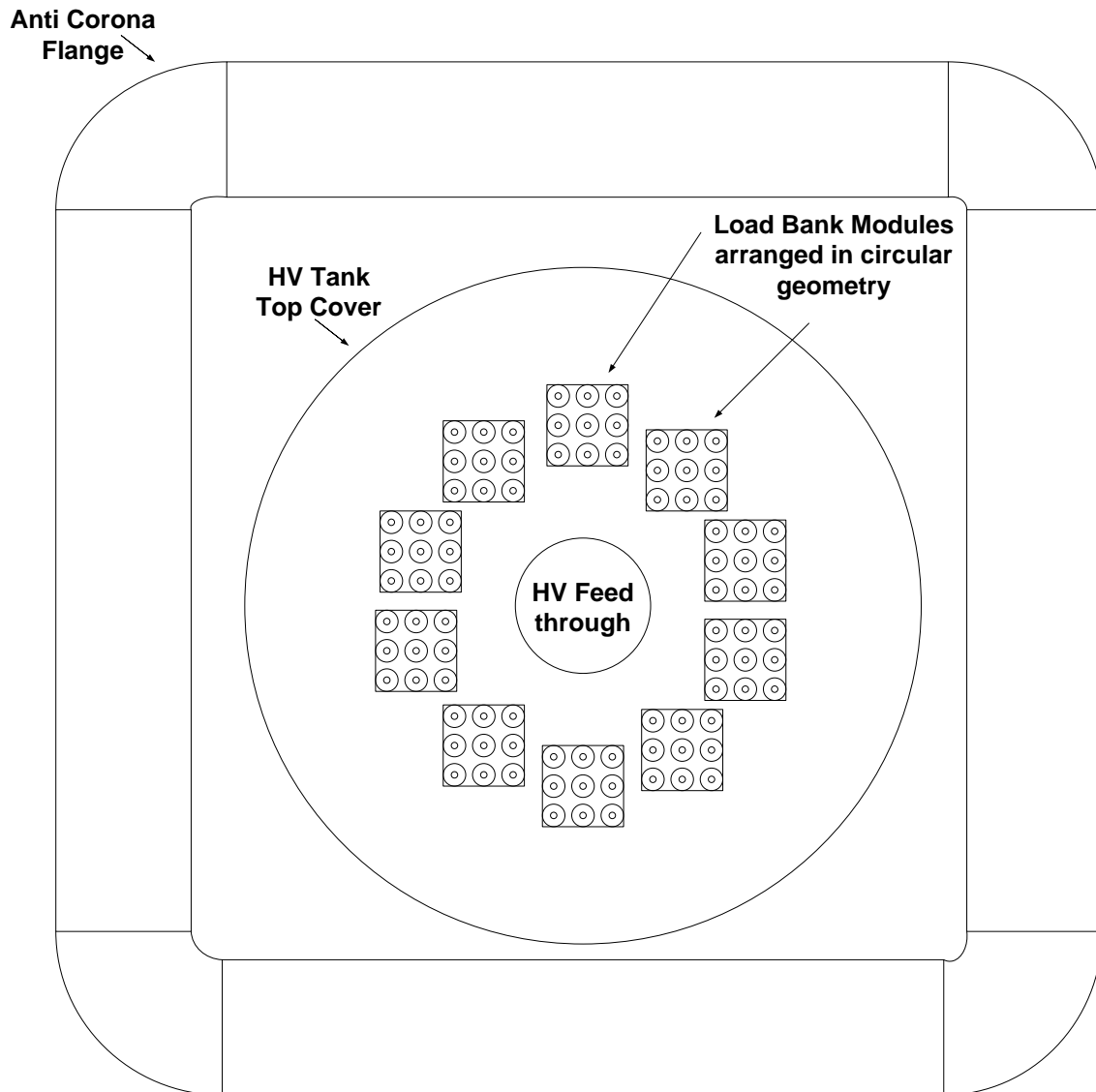


Figure 7: Plan view of 500kV, 100mA, 50kW Load Bank

NOTE:

THE DESIGN, SCHEMATIC AND ASSEMBLY DRAWINGS PROVIDED HERE TO BE CONSIDERED FOR REFERENCE ONLY. BIDDER MAY PROPOSE / SUBMIT HIS OWN DESIGN AND DRAWINGS BASED ON ITS EXPERIENCE AND MANUFACTURING FEASIBILITY ALONG WITH THE BID FOR EVALUATION.



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

Annexure – II

TECHNICAL BID COMPLIANCE

Bidder must submit along with the bid the following documents –

- a) Conceptual technical proposal including electrical schematics, GA drawings etc.
- b) Component Selection, Datasheet and Tentative Bill of Material
- c) Temperature rise analysis and calculations
- d) Loss estimation and calculations
- e) The material specifications of all the parts of the HV tank including accessories and fittings.
- f) Technical Compliance sheet duly filled in data against each parameter.
- g) Tentative contract execution schedule defining major activities / milestones

During the evaluation of technical bids, IPR shall review the submitted technical proposal and may seek further clarifications/discussions with the bidder to ascertain feasibility or viability of the same. If the proposal is found to be incapable of meeting the technical specifications, the bid shall be technically disqualified.

Technical Compliance Sheet for 500kV DC Load Bank

Sr. No.	Parameters	IPR Requirement	Bidder's Specification
1)	Application	To Test and Characterize 500 kV, 100 mA DC Power Supply at different voltage and current ratings	
2)	Constructional	Modular for ease of obtaining the required voltage and current rating.	
3)	Rated Voltage	500kV DC.	
4)	Rated Current	100mA	
5)	Rated Power	50 kW	
6)	Current Selection at rated voltage	Tapping from 10 mA to 100 mA in step of 10 mA	
7)	Resistance Value	5 MΩ ± 5%, at full load or 50MΩ ± 5%, at each tap(module)	
8)	DC isolation from the HV terminal to grounded point	≥ 600 kV DC	
9)	Operating duty cycle	10 Minutes ON, 1 Hour OFF.	
10)	Site Ambient temperature	+ 15 °C to + 50 °C	



Technical Specification for Design, Engineering, Assembly, Factory Acceptance Testing, Supply, Delivery, Installation and Site Acceptance Testing of 500kV, 100 mA, 50 kW DC Oil Cooled Resistive Load Bank

11)	Site Relative Humidity	10 % to 90%	
12)	Temperature rise above ambient temperature	45 ⁰ C	
13)	Temperature coefficient	Less than 500ppm/ ⁰ C	
14)	Tolerance	Initial value \pm 5% or less	
15)	Type of Resistor	Non Inductive Resistors suitable for oil operation with metallic caps on the side	
16)	Cooling	Oil natural air natural	
17)	Insulating medium	EHV grade Mineral / Synthetic oil	
18)	HV Tank material	High grade sheet metal or equivalent	
19)	HV Termination	Through HV feed through/anti corona ring with metal links for different current selection (off load type).	
20)	Installation	Indoor	
21)	Accessories (Specify the make and model no.)	<ul style="list-style-type: none">a) Oil temperature indicatorb) Oil level gaugec) Dehydrating Breatherd) Pressure relief devicee) Gas detection devicef) Earthing rod- FRP rod with brass spade end and suitable length (5 meters) of flexible cable	
22)	Quantity	1 nos.	
23)	Applicable Standards	IEC 60060 Part-1 (1989) / IEC 60060 Part-2 (1994) and as applicable	