BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

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TYPE OF DOC.	**TECHNICAL SPECIFICATION**			**NAME**	**Vyom**	**JK**	**SKS**
TITLE 110kV **ISOLATOR**				**SIGN**			
				DATE	19.01.22	19.01.22	19.01.22
				GROUP	TBEM	**W.O. No**	

CUSTOMER	**TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**
PROJECT	**110KV Switchyard for Renovation, Modernization and Uprating (RMU) OF Kodayar Power House-I from 1X60MW TO 1X70MW.**

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Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution	**To**	**TBMM**	**OFFICE COPY**
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SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES.

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to project sites and supervision of erection, testing & commissioning of 110kV Isolator complete in all respect for efficient & trouble free operation mentioned under this specification.

The specification comprises of following sections

Section-1	Scope, project specific technical requirements & bill of quantities.
Section-2	Standard Technical Specification for Isolator
Section-3	Project details & general technical Specifications for all the equipments under the project.
Section-4	Annexures

In case of any discrepancies between the requirements mentioned under different Sections, order of precedence shall be as follows:
section-1 shall precede section-2, section-2 shall precede section-3

In general, no deviation from the requirements specified in various clauses of this specification shall be allowed and hence, a certificate to this effect shall have to be furnished along with the offer, however bidder shall furnish list of conflicts/ ambiguities/ deviations (if any) in *Schedule of Technical Deviations*. Any conflicts/ ambiguities/ deviations mentioned elsewhere in technical offer shall not be reviewed. In case the deviations mentioned in the *Schedule of Technical Deviations* are not technically acceptable, the offer of the bidder will be liable to rejection.

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the enquiry.

The Isolators are required for the following Project

Customer: Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)

Project: 110KV Switchyard for Renovation, Modernization & Uprating (RMU) of Kodayar Power House-1 from 1 X 60MW to 1 X 70MW

2.0 SPECIFIC TECHNICAL REQUIREMENTS

All equipments shall perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation.

All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc for the equipment.

The equipment shall also comply to the following:

a) To facilitate erection of equipment, all items to be assembled at site shall be “match marked”.

b) All piping, if any between equipment control cabinet/operating mechanism to marshalling box of the equipment, shall bear proper identification to facilitate the connection at site.

Bidder to submit detailed “guaranteed and technical particulars” and “detailed drawings” for Isolators during contract stage for approval. Bidder may need to visit to BHEL / TANGEDCO corporate engineering office for drawing / document approval if standard approval is not available.

3.0 GENERAL TECHNICAL REQUIREMENTS

1	Min. No. of auxiliary contacts on each isolator	Besides requirement of this spec., the bidder shall wire up 8 NO +8 NC +2 MBB 110kV Isolator) to TBs (Reversible) for purchaser's future use
2	Min. No. of auxiliary contacts on each earthing switch	Besides requirement of this spec., the bidder shall wire up 8 NO + 8 NC for 110kV Isolator to TBs (Reversible) for purchaser 's future use.
3	Number of terminals in Control cabinet **(Interpole Cabling shall be supplied By BHEL)**	(1) All contacts and control circuits are to be wired upto control cabinet including potential free auxiliary contacts of Isolator/Earth switch. (2) Additional spare TBs shall be provided in Master MB for termination of all NO & NC Contacts at the Master MB after interpole cabling. (3) Sufficient TBs shall be provided in control cabinet for looping of AC supply from master to follower of Isolator and earth switch.
4	TB size & Type	(1) TBs shall be stud type (2) Power Cable-Each TBs Should be Suitable for terminating two wires of 10 Sq. mm size on each side (3) Control cable- Each TBs Should be Suitable for terminating two wires of 2.5 Sq. mm size on each side or extra TB to be provided.
5	Local remote switch indication of Isolator for Substation Automation	Yes

	system (SAS)	
6	Support structure of Isolator	Lattice type
7	Distance between Center-line of busbar for equipment connection and plinth level	4.6m (for 110kV' Isolator, ground mounted)

Bidder to submit detailed "guaranteed and technical particulars" and "detailed drawings" for Isolators during contract stage for approval. Bidder may need to visit to BHEL / TANGEDCO corporate engineering office for drawing / document approval if standard approval is not available.

4.0 PROPOSED INSULATOR FOR 110kV ISOLATORS

Sl. No.	**Parameter**	110kV
1.	Total minimum creepage distance in mm (i.e. 25 mm/kV)	3075
2.	Cantilever strength of Insulator in kg	600
3.	Height of insulator in mm	1500
4.	Top PCD in mm	127
5.	No. of holes on top	4x M16
6.	Bottom PCD in mm	184
7.	No. of holes on bottom	4x 18 dia.

5.0 BILL OF QUANTITIES:

S.No.	DESCRIPTION	UNIT	QUANTITY	REMARKS
1	110kV , 1250 A, 3 phase, 40kA for 3 sec, HDB isolator with one Earth switch (mechanically ganged, motor operated for isolator/earth switch) with operating mechanism along with all accessories, complete in all respects	Set	2	
2	110kV , 1250A, 3 phase, 40kA for 3 sec, HDB isolator without Earth switch (mechanically ganged motor operated) with operating mechanism along with all accessories, complete in all respects	Set	3	
3	Supervision of Erection, Testing & Commissioning of supplied 110kV , 3 phase, HDB Isolators **(for Sno 1 and 2 above)**	Lot	5	
4	Flexible braided copper along with lugs for earthing (1 Set = Qty. required for 1 No 110kV , 3 phase HDB isolator without earth switch/with one earth switch)	Set	5	

Notes:

5.1 Total contract value may vary up to ±20% at contract stage.

5.2 Prices for all applicable accessories of Isolators shall be included in the equipment prices.

5.3 Respective dates for the commencement of erection, testing and commissioning activities of Isolators shall be communicated to manufacturers from time to time as per the readiness of respective sites.

5.4 Flexible braided copper of adequate capacity for Earthing between bottom of rotating support post insulator and 75x12 mm MS flat running on channel shall be in Bidder scope (refer attached Annexure-B for detailed of flexible copper Earthing). Required lugs for connection of flexible copper braided at both end shall be in Bidder scope. The sizing calculation of flexible copper braided shall be submitted by the Bidder during detailed engineering stage. Supply of 75x12 mm MS flat shall be in BHEL scope.

5.5 Fixing hardware of Earthing flat (i.e. 75X12 mm/ 50x8 mm MS flat) to MOM box and isolator shall be in bidder scope.

5.6 Inter pole cables and glands shall be supplied by BHEL.

5.7 Terminal pad /stud of isolator shall be suitable for twin moose ACSR conductor /3" Al Tube.

5.8 All the Isolator support insulators, terminal connectors and support structure will be supplied by BHEL.

5.9 Supply of mounting hardware for fixing Isolators and MOM box on support structure shall be in Bidder scope.

5.10 Prices for accessories of Isolators shall be included in the equipment prices.

6.0 TECHNICAL QUALIFYING REQUIREMENTS:

Please refer the following Annexure_**TQR**

7.0 SUPERVISION OF ERECTION COMMISSIONING AND TESTING:

Supervision of Erection, testing and commissioning of all supplied Isolators and earth switches shall be carried out under the supervision of the Isolator manufacturer's representative. The commissioning report shall be prepared and signed by the manufacturer's representative.

However, required unskilled men power/Labor, tools (other than special tools and tackles which shall be in bidder's scope) shall be provided by BHEL.

The respective dates of commencement of erection, testing and commissioning activities by BHEL will be intimated to the equipment supplier from time to time, so that arrangements for supervising the activity can be made accordingly by the manufacturer.

8.0 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

Bidder shall submit valid type test reports (as per relevant IEC/IS Standard) for approval. The type test reports submitted shall be of tests conducted within last 10 years prior to the date of technical bid opening of this tender. The bidder should have conducted type test on identical or similar equipment/ components to those offered. If these tests have been conducted more than 10 years' prior the date of technical bid opening or type test reports are found to be technically unacceptable to BHEL/TANGEDCO, the type test shall be conducted without cost and delivery implication to BHEL. Type test report shall be reviewed for approval in detailed engineering stage only.

9.0 QUALITY PLAN

Bidder to follow valid TANGEDCO approved Quality Plan as per TANGEDCO/BHEL procedure. In case the bidder doesn't have TANGEDCO/BHEL approved Quality Plan, it will be the bidder's responsibility to get its Quality Plan approved directly from the ultimate customer M/s TANGEDCO/BHEL Corporation of India Limited.

10.0 TECHNICAL DEVIATIONS:

The bidder shall list all the deviation from the specification separately. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

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TECHNICAL QUALIFYING REQUIREMENT

Bidder should be manufacturer of the offered Isolator. Bidder needs to meets the following technical requirements for 110KV Isolator as stipulated here under:

The manufacturer(s) whose 110KV Isolator (s) are offered, must have, manufactured, type tested (as per IEC/IS or equivalent standard) and supplied 110kV or higher voltage class Isolator as on the original date of technical bid opening of this tender.

GENERAL POINTS (NOTES)

- Consideration of offer shall be subject to customer approval of bidders, as applicable.

09/02/2022
PREPARED BY

09/02/2022
REVIEWED BY

09/02/22.
APPROVED BY

TECHNICAL - 110 KV AB SWITCHES

1.0 SCOPE:

This section covers the design, manufacture, testing before dispatch and delivery at destination of AB Switches as detailed below:

1.01. This will be mounted on reinforced concreted structure or lattice steel boom at a height such that the terminal pad will be 4600 mm above plinth level and manual operating handle at a height of 1000mm above ground level, phase to phase spacing shall be 2800 mm.

1.02. 110 KV 50 cycles double break switch with turn & twist mechanism as item 1.01 above with the switch terminals at a height of 4600 mm above plinth level and manual operating handle at 1000 mm level.

2.0 DESIGN:

a. The switches will be mounted upright on reinforced concrete structures or lattice steel boom. (Purchaser Scope)
b. The switches should be provided with dependant manually operating mechanism.
c. The short time current rating of the earthing switch shall be minimum 31.5 KA(rms) for 1 (one) second or 40.0 KA (rms) for 3 (Three) seconds and for main switch shall be minimum 40.0 KA (rms) for 3 (Three) seconds as specified in **IS /IEC -62271-102** of latest issue. The rated peak short circuit current shall be 2.5 times that of rated S.T.C.
d. The equipment offered should be entirely satisfactory for the operation under tropical conditions in humid atmosphere of Degree C in shade and at an altitude not exceeding metres above sea level.
e. The Switches have minimum momentary rating of 100 KA. The minimum double break switch gap shall be 810 mm (approximately).

2.06. Current Density to be adopted for all parts of the isolator and terminal connector shall not exceed the following limits:

a) Hollow tube sections - Copper : 2.0 Amps/ Sq.Mm.
b) Other Sections - Copper : 2.0 Amps/ Sq.Mm.
c) Terminal Pad and connectors – Aluminium 1.0 Amps/ Sq.mm

3.0 TERMINAL CONNECTORS:

Clamp type terminal connectors shall be supplied and bolted to the terminals of the switches. They shall be hot tinned to prevent corrosion when connected to Aluminum bus. The clamps bolts should be made entirely of non - ferrous parts with non-magnetic steel bolts and nuts. The terminal connectors to be supplied shall conform to and tested as per IS 5561 of latest issue. The name of the supplier of terminal connectors shall be furnished along with the tender.

4.0 BASES:

The bases shall be of heavy fabricated hot dip galvanized of size not less than 2 Nos. 125 X 65 x 6 MS Channel welded together to form a box type construction drilled to accommodate the bearings and to suit the steel work required

with hot dip galvanized bolts, washers, nuts etc. for mounting the switch and for operating from ground shall be included. All bearings shall be of tapered roller bearings of adequate size so that the moving insulator should not wobble while closing or opening. The bearing housings should be provided with lubricating arrangement.

Bottom PCD holes shall be slotted holes to match insulators PCD 184/ 210 mm. Top PCD of Insulators is 127 mm.

5.0 EARTHING DEVICE:

One earthing switch per pole forming an integral part of the line disconnecting switch and manually operated shall be supplied.

The earthing switch shall match with main switch. A suitable flexible braided connection shall be provided on the hinge end of the earthing blade for connection to ground bus

The operation will be by hand without using any other supply or storage of energy and therefore is entirely dependent on the operator. The switches shall be provided with a blade for earthing the incoming supply side and the device shall be capable of operation at ground level. The operating rods of all switches shall be supplied with a clamp and of copper flexible braid of each 25 x 3 mm totaling to number suitable for the rated capacity. This arrangement is for grounding the operating assembly and copper flexible should run through the connecting pipe between earth switch moving contact and fixed contact.

The shunt-earthing blade operating mechanism should be so mechanically linked with the operating mechanism of the series switch so that the earthing blade cannot be closed, when the series switch is closed and the series switch cannot be closed when the earthing switch is closed. In addition, key interlocks shall be provided, for the series switch to permit operation in the desired sequence only. Two numbers earthing terminals on the base channel shall also be supplied.

6.0 KEY INTERLOCKING :

Prices quoted shall include mechanical interlock both for the main switch with the corresponding circuit breaker and for the earth blade with the main switch.

7.0 NORMAL OPERATING DUTY :

The switches will be normally closed or opened for the following purpose.

i) To make or break the magnetizing currents up to 7 amps of 110KV class power transformers up to a rating of 25 MVA.

ii) To make or break the charging currents up to 6.3 amps with the instrument transformers, lightning arresters and supporting insulators of 110KV bus in Sub-stations.

iii) To make or break the line charging current of short 110KV lines up to 6.3 amps.

iv) To transfer loads from one bus to another in stations provided with duplicate bus bars, the potentials at the two terminals of the switch before and after the operation being practically the same in magnitude and phase or within 15 percent of normal voltage.

8.0. FIXED AND MOVING CONTACTS :

a. The isolator shall have heavy-duty self-aligning high-pressure contacts of modern design. The contact shall be made of high grade, high conductivity, heat, resisting material. The main contacts shall be made of hard drawn, electrolytic copper and the surface shall be silver-plated. Arcing contacts wherever provided, shall close first and open last.

b. The isolator blades/arms shall be made from tubular section of hard drawn electrolytic copper having suitable diameter and shell thickness, and the contact surface shall be heavily silver plated.

c. The surface of the contacts shall be liberally designed to withstand safely the highest short circuit current.

d. The fixed contacts of hard drawn electrolytic copper flat shall be of the high pressure type with pressure relieving springs and have a wiping action during closing and opening. They shall be silver surfaced Suitable insulators to prevent current flowing through the springs should be provided. Fixed arcing horns should be mounted on the fixed contacts.

e. The male and female contact assembly and blade shall ensure

   a. Electro dynamic withstand ability during short circuit without any risk of repulsion of contacts.
   b. Thermal withstand ability during short-circuits.
   c. Constant contact pressure even when the live parts of the insulators stacks are subjected to tensile stresses due to linear expansion of connected bus-bars, flexible conductors either because of temperature variation or strong winds.
   d. Self-wiping action during closing and opening operation to remove any film, oxide coating, etc. Wiping action shall not cause scouring or abrasion of surfaces.
   e. Self-alignment ensuring smooth closing of the switch. The temperature rise of the contacts and other current carrying parts shall be as per relevant IS., while carrying the rated current continuously. The temperature rise due to passage of rated short-circuit current shall not cause any annealing or welding of contacts.
   f. Fixed guides shall be provided so that proper seating of contacts will be obtained by closing even when a blade is out of alignment by 2.5 mm or less.
   g. All movable parts, which may be in the current path, shall be shunted by flexible copper conductors to prevent breaking due to repeated bending.
   h. Fabrication shall be made with suitable jig to avoid deviation during production. Details of size and shape of contact, springs, back plate, fixing arrangements, design of contact pressure, life of contacts, limit of temperature rise etc., shall be furnished along with the tender.

f. Isolators and Earth Switches shall be capable of withstanding the dynamic and thermic effects of the maximum possible short circuit current of the systems in their closed position. They shall be constructed such that they do not open under influence of short circuit current.

9.0. MOUNTING OF CONTACTS:

The contacts shall rest on a Aluminium / Teflon block and with initial tension. Suitable device shall be provided to prevent dashing. Fabrication, welding etc., shall be done in suitable jig to avoid deviations during production.

10.0. TURN AND TWIST MECHANISM:

Turn and Twist mechanism shall be provided with adequate locking to avoid opening or loosening by wind, short circuit force etc., on moving blade. The springs shall be made out of stainless steel to have adequate strength and resilience and shall be encased with grease to avoid exposure to rain. The clamps and plates be made out of at least 10 mm thick M.S. Plate or flat. Fasteners with unlock nuts shall be used wherever necessary. Vulnerable parts shall be fabricated by tubular gas cutting and milling. The entire mechanism shall be fabricated in suitable jig and template to avoid deviations during production.

All live parts shall be designed to have smooth surfaces without any sharp points edges and other corona producing surfaces so as to eliminate corona at specified extinction voltage or 1.1 x rated voltage, if extinction voltage is not specified.

11.0. FASTENERS:

Fasteners shall be hot dip galvanized conforming to relevant IS. Fasteners / Bolts and nuts of size less than 16 mm shall be Hot Dip Galvanized / Electroplated as per relevant IS.

12.0. BEARINGS:

12.01 Tapered roller bearing for rotating insulator stack and thrust ball bearing guides for operating handle shall be provided.

12.02 The design and construction of the various bearings should embody all the features required to withstand the climatic conditions specified to ensure dependable and effective operation, even after long period of inaction.

12.03 Rotating insulators shall be mounted on a housing with bearings. The housing for insulators shall be made of gravity die cast metal with smooth surfaces and suitably machined for seating the bearings. Two nos. of bearings with adequate shaft diameter and distance between the bearings shall be provided to avoid wobbling during operations. Bearing at the top shall be ball bearing and bottom bearing shall be thrust bearing. The bearings shall be of reputed make and lubricated for life. All other friction locations shall be provided with suitable bearings or stainless or brass bushes. The bearings bushes, joints, springs, etc. shall be so designed that no lubrication shall be required during the service. Complete details of bearings, bushes, housing, greasing, etc., shall be furnished with tender.

13.0. TANDEM PIPE :

Tandem pipe shall be used for phase coupling of double break isolator. Base plate of insulators for connection of tandem pipe shall be made out of one piece of at least 8 mm thick MS plate. Bolt and shackle, device shall be used to connect tandem pipe to the base plate. Wherever unavoidable, sliding clamps may be used. These clamps shall be made out of at least 8 mm thick MS flat with four Nos. of nuts and bolts. The diametre of Tandem Pipe shall be 32 mm, Class – B, G.I. Pipe. (Weight - 3.25 KG/M)

14.0 DOWN PIPE:

The pipe shall be terminated into suitable swivel or universal type joint between the insulator bottom bearing and the operating mechanism to take care of marginal angular misalignment at site. All brackets, guides, etc., shall be mounted on the base of the isolator. The diametre of down pipe shall be 50 mm, Class - B, G.I.Pipe. (Weight - 5.32 KG/M)

NOTE : The diameter of the above tandem pipe and down pipe are INNER DIA METRE only.

15.0. PAD LOCKING DEVICE :

The isolator and earthing switch shall be provided with padlocking device to permit locking of the isolator and earthing switch in both fully open and fully closed positions.

16.0. EARTHING :

Flexible copper connections shall be provided between rotating earth blades and the frame, which shall have a cross section of at least 75 mm square and shall be tinned or suitably treated against corrosion.

The frame of each disconnect and earthing switch shall be provided with two reliable earthing terminals for connection to the purchaser's earthing conductor/flat and clamping screw suitable for carrying specified short time current. Flexible ground connectors shall be provided for connecting operating handle to the earthing flat. The diameter of clamping screw shall be at least 12 mm. The connection point shall be marked with earth symbol.

17.0. ASSEMBLY :

The disconnect shall be fully assembled at the works of the tenderer. Typical operation shall be carried out on each type of fully assembled disconnect to ascertain that all parts fit correctly and function satisfactorily.

18.0. GALVANISING AND CLIMATE PROOFING :

All ferrous parts such as structural steel, pipes, rods levers, linkages, nuts and bolts used in other than current path etc. shall be hot dip galvanized. Galvanisation shall be done after completion of fabrication, which shall be capable to prevent corrosion in view of the severe climatic conditions. Thickness of zinc coating shall not be less than 610 gm of zinc per sq. meter of surface Zinc coating shall be smooth, clean and of uniform thickness and free from defect. Preparation of galvanising and the galvanising itself shall not adversely affect the mechanical properties of the coated material. The quality shall be established by tests, as per IS-2633. Galvanising of nuts and bolts shall be carried out by centrifugal or suitable process so that the bolts will easily fit into the tapped holes/ nuts.

All components shall be given adequate treatment of climate proofing as per IS-3202 so as to withstand corrosion and severe conditions.

Complete details of galvanising and climate proofing of the equipments shall be furnished in the tender.

19.0. QUALITY ASSURANCE PLAN :

The tenderer shall invariably furnish following information along with his offer. Information shall be separately given for individual type of the AB Switches.

i) Statement giving list of important raw materials/bought out items/accessories, including but not limited to :

a) Copper

b) Steel
c) Springs
d) Bearings
e) Nuts & Bolts
f) Greases

ii) Operating mechanism and its components such as terminal block, interlocks, etc.

ii) Name of sub-suppliers for the raw materials/bought out items, list of standards according to which the raw materials/bought out items are tested, if available, list of tests normally carried out on raw materials/bought out items in presence of tenderer's representatives and copies of test certificates, if available, etc.

iii) Information and copies of test certificates as in (i) and (ii) above in respect of bought out materials/accessories as per Annexures III and IV.

iv) List of manufacturing facilities available

v) Level of automation achieved and list of areas where manual processing still exists.

vi) List of areas in manufacturing process, where stage inspection are normally carried out for quality control and details of such tests and inspections.

vii) Special features provided in the equipment to make it maintenance free.

viii) List of testing equipments available with the tenderer for final testing of equipment and test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements. Type test certificates of the raw materials and bought out accessories shall be produced to the inspection officer for scrutiny during inspection

20.0. LIST OF DRAWINGS AND DOCUMENTS :

The tenderer shall furnish following along with his offer.

ii) Name plate drawing
iii) Type test reports in case the equipment has already been type tested.
iv) Test reports, literature, pamphlets of the bought out items and raw materials.

21.0. SIZE AND DIMENSIONS :

The details of sizes and dimensions of fixed, moving contacts, Base channel, Tandem and operating pipes etc shall be as per the approved drawings enclosed.

22.0. OPERATING MECHANISM :

The three single pole switches shall be joined by inter phase connecting rods for group operation. The operating shaft shall be equipped with suitable grounding clamps.

The switches shall be operated by means of a handle supplied with couplers and supporting brackets.

23.0. CLEARANCES :

All clearances of live parts between phases and earthed metal parts of switches shall be adequate for a maximum service voltage plus 10% and shall conform to IS 9921

of the latest issue for switches. Adequate clearance may be provided between the tandem pipe and the line switch blades by providing stool of 100 mm at least and the tandem pipe below the fixing plate.

24.0. SHORT CIRCUIT REQUIREMENTS :

The rated peak short circuit current or the rated short time current carried by AB Switches for the rated maximum duration of short circuit shall not cause :-

a. Mechanical damage to any part of the AB Switches
b. Separation of the contacts or contact welding and
c. A temperature rise likely to damage insulation

After the passage of these currents, the AB Switch shall be able to carry its rated current under specified conditions and the operation of the operating device shall not be impaired.

25.0 GROUNDING PADS:

Each pole of the isolator shall be provided with two pads of non-corrodible material at opposite ends braced to channel base. Flexible copper ground connectors shall be provided for connecting operating handles of isolators to the grounding system.

26.0. NAME PLATE:

A weatherproof and corrosion proof name plate shall be provided on isolators, earthing switches. It shall be mounted in such a position that it is visible in the position of normal service and installation.

27.0. INSULATORS :

The insulators required for switches will be procured by the customer separately. The contacts to be mounted on the insulator should seat flush with the insulator and no part should protrude below the mounting flange.

28.0 SUPPORTING STRUCTURE:

Supporting structures for isolator and earthing switches which may be of RCC or steel are excluded from the scope of supply.

However, Vendor shall furnish detailed dimensioned drawings indicating weights and all fixing details and relative locations of chassis, operating mechanism box and operating handles. Final responsibility for ensuring that mounting and supporting arrangements of isolator are proper and that there is no interference of any part of the isolator with supporting structures will rest with the vendor.

29.0.CODES AND STANDARD :

The switches shall conform to Specifications of the latest issue/amendements (IS/IEC of latest issue) as per Annexure – II.

30.0. TESTS AND TEST CERTIFICATES :

30.01. TYPE TESTS :

Tenderers are requested to furnish copy of type test certificates for the tendered material/equipment of their make in full shape along with their offer as

conforming to relevant IS&IEC Standards of latest issue **IS /IEC -62271-102** obtained from a Government/ Government recognized Laboratory or NABL accredited standard laboratories. The above type test certificates should accompany the drawings of the material/equipments, duly signed under seal by the Institution who has issued the type test certificate.

Submission of Type Test Certificates, including but not limited to the following.

Sl. No.	Details of Type Test
1)	Short Time Withstand and Peak Withstand Current Tests for Main Switch and Earth Switch.
2)	Resistance Measurement and Temperature Rise Test of Main Circuit. (After Short Time Withstand Current and Peak Withstand Current Test)
3)	High Voltage Tests.
4)	Mechanical Endurance Tests for Main Switch and Earth Switch. The mechanical terminal load recommended to conduct the Mechanical Endurance Test as furnished in Table 3 of Clause 4.103 (Rated Mechanical terminal loads) of latest IS/IEC 62271-102 may be followed for main switch and earth switch.

The above type test should have been conducted not earlier than **Ten years (10 years) as on the date of Tender Opening**.

30.02. The original type test certificates shall be furnished for verification on request.

30.03. The details of type test should also be furnished in the Schedule - G.

30.04. If warranted the purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative at no extra cost. For any change in the design/type, already type tested and the design/type offered against this specification the purchaser reserves the right to demand, repetition of tests without any extra cost.

30.05. During the type test the disconnect shall be mounted on its own support structure or equivalent support structure and installed with its own operating mechanism to make the type tests representative. Drawing of equivalent support structure, if any, and mounting arrangement made for type tests shall be furnished for purchaser's reference.

30.06. All routine tests as specified in IS/IEC-62271-102 of the latest issue shall be carried out on each switch and the test results shall be furnished for approval.

30.07. Manufacturer's test certificate in respect of all materials as specified in IS 9921 of the latest issue and elsewhere in the specification shall be furnished in triplicate.

30.08. In addition to the above tests, the purchaser reserves the right of carrying out at site such tests as he may decide upon. Such additional test shall be carried out at the purchaser's cost.

30.09. The entire equipment shall after erection be run for 60 days under normal operating conditions. Any defects discovered during this period shall be rectified free

of all charges to the purchaser. The equipments should be set properly and demonstrated to function correctly.

30.10. Test certificate furnishing the results of routine tests as per appropriate Indian Standard Specification should be forwarded for the equipment before despatching the materials. The equipments will be rejected, if the test results are not satisfactory.

30.11. The customer reserves the rights to have the Acceptance Tests as specified in IS /IEC -62271-102 of the latest issue.

30.12. Test certificates and documents of the following items, if available, shall be furnished at the time of routine/acceptance tests:

a) Chemical analysis test certificate of copper of electrolytic grade.
ii) Aluminium
iii) Test reports for steel used for Isolator Base frame.
iv) Pipes.
v) Any other items (List to be furnished by the tenderer)

The purchaser may at his discretion request additional test certificates for other items as reasonably required to substantiate the quality of the same.

31.0. INSPECTION:

31.01. The authorized representatives of the purchaser shall have access to the supplier's or sub-vendor's works at any time during working hours, for the purpose of inspecting the manufacture of the materials and for testing the selected samples from the materials covered by this specification. The supplier or the sub-vendor shall provide facilities for the above.

31.02. Tenderers are requested to furnish in their tenders the exact location of their factory with detailed address to enable inspection by customer if considered necessary.

31.03. Not less than 15 days advance intimation shall be given about the quantity of materials that will be ready for inspection by the Tcustomer ; Officers/Third Party Inspecting Agency authorized by the customer . The arrangement for inspection shall be made by suppliers in such a way that the delivery schedule is kept up. The materials shall not be despatched without instruction from customer .

32.0. <u>COMPLETENESS OF CONTRACT :</u>

The supplier should supply all minor accessories even though not specifically mentioned in the tender specification or purchase order but which are essential for the completeness of the materials ordered and their satisfactory & efficient operation. The supplier is not eligible for any extra charges in respect of such minor accessories though not included in the tender specification or purchase order.

33.0. INTERCHANGEABILIY:

All similar parts and removable parts of similar items shall be interchangeable with each other.

34.0 RAW MATERIALS:

It is the responsibility of the supplier to make his own arrangement to procure the necessary raw materials required for the manufacture.

35.0 CLIMATIC CONDITIONS:

The materials are for use in Tamil Nadu and should be satisfactory for operation under tropical conditions in Tamil Nadu.

a. The ambient temperature will be within the range of +10 Degree Centigrade to +50 Degree Centigrade.
b. The altitude will be less than 2500 metres
c. The maximum atmospheric humidity will be in the range of 95%
d. Average number of thunder storm days per annum is 65.
e. Average number of dust storm days per annum is 5.
f. Average number of rainy days per annum is 65.
g. Average annual rainfall is 100 cm.
h. The climatic conditions are prone to wide variation in ambient condition and equipments offered shall be suitable for installation at any of the substations and or transmission lines in Tamil Nadu.
i. All electrical devices shall be given tropical and fungicidal treatment. Fog, smoke and milked acids are also present in the atmosphere.

The tenderer should include all minor accessories not specifically mentioned in the specification but essential for the completeness of the equipment. The tenderer shall not be eligible for any extra charges in respect of such minor accessories though not include in the tender.

36.0. GUARANTEE :

The contractor shall guarantee, among other things, the following :

i) Quality and strength of materials used.
ii) Safe electrical and mechanical stress on all parts of the equipment under all specified conditions of operation.
iii) Satisfactory period of operation as stated in Clause 12 of SECTION – V-COMMERCIAL
iv) Performance figures specified by the tenderer in the schedule of guaranteed particulars.

37.0. GUARANTEED PARTICULARS :

The tenderer shall furnish, without fail, all the particulars of the materials offered as indicated in Annexure – I.

38.0. ERECTION :

The equipments included in this specification will be erected departmentally. However, the switchgears should be arranged to be checked by a works trained Engineers of your Company before commissioning, free of cost to the department.

39.0.EXPERIENCE :

The tenderer shall furnish a list of sub-stations/Electricity]customer ; wherein similar equipments of their make are in service for reference.

40.0 DELIVERY:

40.1 Customer will be at liberty to cancel the order, if the supply is not made as per the delivery schedule, not withstanding its rights to claim liquidated mages for the belated supplies and ;the quantity outstanding to be supplied as on the date of cancellation. In addition to the liquidated damages for the delay, the defaulting contractor will be liable to pay the customer the actual

ANNEXURE –I

SCHEDULE OF GUARANTEED TECHNICAL AND PERFORMANCE PARTICULARS

SL. NO	DESCRIPTION	110 KV AMPS Double Break Centre Rotating AB switches without earth	110 KV AMPS Double Break Centre Rotating AB switches with earth
01	Manufacturer's Name & Address		
02	Manufacturer's Type and Designation		
03	Standard to which equipment conforms		
04	Rated Voltage KV		
05	Maximum design voltage at which the isolator can operate KV		
06	Rerating factor, if any, for specified test conditions		
07	Current rating. a)Continuous current A b)Dynamic Current KA c)Three seconds short time Current		
08	Capacity to interrupt magnetizing current A		
09	Capacity to interrupt line charging Current A		
10	Maximum Temperature : a) Of current carrying parts when carrying rated continuous current Degree C b) Ambient temperature (Maximum/Average for which (a) is applicable) Degree C		
11	Number of Poles		
12	Operation : i) Main Switch ii) Earth Switch		
13	Number of breaks per circuit per pole i) Main Switch ii) Earth Switch		
14	Total Length of break per pole (min. air dist., across the isolating distance) mm		

15	Insulation Level : a) Dry one Min. power frequency withstand voltage i) Across isolating distance : KV rms. ii) To earth & between poles : KV rms. WetoneMin. Power Frequency Withstand Voltage. i) Across isolating distance : KV rms. ii) To earth & between poles : KV rms. 1.2/50 micro second impulse withstand voltage i) Across isolating distance : KV peak ii) To earth & between poles : KV peak		
16 a)	Switch contacts Type of Contacts for Main Switch/Earth Switch a) Type of contacts i) Fixed contacts ii) Moving contacts b) Material i) Fixed contacts ii) Moving contacts c) Area of contacts : Sq.mm d) Whether contacts are silver plated e) Thickness of silver coating f) Contact pressure g) No. of operation isolator can make without deterioration of contacts.		
17	Contact support i) Material and size of channel ii) Material and size of plate		
18	Clearance i) Between Poles Between Live Parts and Earth Between fixed contact & blade in open position. Minimum clearance between live parts when switch is open. On the same pole Between adjacent pole.		

19	Type of operating mechanism a) Manual operation Isolator. i) Type (Reduction gear type) ii) Type of the operating handle hinge pin from ground level.		
20	Bearing Rotating Insulating stack & Operating Guide (i) Location Type Qty. of bearings Size. Bearing No. b) Material and size of housing c) No. of bushes, joints, location & size d) Make of bearing (Reputed makes. Tenderer to specify.)		
21	Operating GI pipe i) Tandem Pipe : Class of G.I. Pipe No. of Pipes Wall thickness of G.I. Pipe Dia of tandem G.I. Pipe : mm Size of shackle and screw No. of Clamp and material and size ii) Down Pipe : Class of G.I. Pipe Wall thickness Dia. of down Pipe Type of Joint : Between Rotating stool bearing and down pipe Between down pipe and operating mechanism		
22	Type and Material of Isolator terminals		
23	Type and Material of Terminal Connectors		
24	Torque required to operate the group operating switch Kg.m		
25	Type of Interlock		
26	Maximum torsion strength Kg.m		
27	Maximum bending strength that will be subjected on the post insulator on the opening and closing of isolator		
28	Rated Mechanical terminal loads i) Straight Load NKg. ii) Cross Load NKg.		

29	Nuts and Bolts a) Size, Material and Grade in live parts. b) Size, Material and Grade in other parts. c) Whether hot dip galvanized d) Conforming to IS.		
30	Insulator base plate Material and size of elevator plate below fixed insulator Material and size of stud & bolts Material & size of rotating insulator base plate		
31	Phase spacing		
32	Terminal Stud : a) Dimensional Drawing No. b) Whether Horizontal or Vertical c) Diameter (mm) d) Length e) TPI, if threaded.		
33	Clamp Body : a) (i) Alloy Composition (ii) Plating, if any b) Bolts : (i) Alloy Composition (ii) Tensile Strength c) Types of Washers used d) Range of diameter of conductors that can be received. e) Maximum temperature rise when carrying rated current at 45 Degree C ambient temperature. f) Weight of each type of clamp Kg.		
34	Indication mechanism for position of switch		
35	Switch Design : Rotating/Tilting/Lifting Insulator Horizontal/Vertical Break		
36	Operating mechanism Reciprocating/ Torsional		
37	Base : Constructional feature Size of steel section used (mm) Overall size (mm) d) Total weight (Kg)		
38	Actual Dimensions of switch per phase		
39	Weight of the Isolator/Pole		

40	Weight of the Isolator (complete)		
41	Dimensions of Switch L X B X H Metres.		
42	Shipping dimensions of largest package Metres		
43	No. of AB Switches fabricated per shift per day - No. of Shifts.		

ANNEXURE – II
GOVERNING STANDARDS FOR AB SWITCHES

Sl. No.	IS/IEC of latest issue	Description
1	(IS/IEC-62271-102)	Specification for alternating current disconnectors (Isolators)and earthing switches for voltages above 1000V
2	IS: 7608	Phosphor bronze wires(for general engineering purpose)
3	IS:2108	Black hard malleable iron castings
4	IS:1570(Part II)	Carbon Steel (Un alloyed Steel)
5	IS:2071(Part I&II)	General definitions and test requirements and test procedures
6	IEC:129	Alternating Current disconnectors(Isolators)and earthing switches
7	IS:7906	Helical Compression Springs
8	IS:5561	Electric Power Connectors
9	IS:5358&IS 2629	Galvanizing of ferrous parts
10	IS:2633	Method of testing conformity of coating of zinc coated articles
11	IS:3202	Climate proofing
12	IS:4759	Hot Dip Galvanization of coating on structural steel
13	IS3033	Spring Washers
14	IS:2016	Plain washers
15	IS:1573	Electro plate coating of Zinc on Iron &Steel

PROJECT INFORMATION AND GENERAL TECHNICAL REQUIREMENTS

The provisions under this section are intended to supplement general requirements for the materials, equipment's and services covered under other sections.

[1] PROJECT INFORMATION

1.1 Project Title: Renovation, Modernization & Uprating of Kodayar Power Power House - I from 1x60MW to 1x70MW in Tirunveli Generation Circle in the Kanyakumari District, Tamil Nadu, India .

Owner: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

Transport facilities : Road/Rail

1.2 Meteorological Data

(i) Maximum ambient temperature : 50ºC
(ii) Minimum ambient temperature : 20ºC
(iii) Maximum daily average ambient air temperature : 45º C
(iv) Maximum yearly average ambient air temperature : 32º C
(v) Maximum Humidity (%) : 100%
(vi) Average thunder storm days per annum : 50
(vii) Average rainy days per annum : 90
(viii) Average annual rainfall (mm) : 1000 mm
(ix) Maximum wind pressure : 150 Kgf/Sqmm
(x) Altitude above MSL : Below 1000M

However for design purpose, ambient temperature should be considered as 50ºC and relative humidity as 100%.

[2] ELECTRICAL DATA

2.1 MAIN ELECTRICAL PARAMETRS/ CLEARANCES :

Sl.	Technical Parameter	Unit	-
1	Type of Switchyard		AIS
2	Nominal voltage class, rms	kV	110
3	Maximum System voltage, rms	kV	123kV
4	Current Rating	A	1250A
5	Number of phases	Nos	03
6	Symmetrical Short time withstand current	kA/Sec	40 kA for 3 sec.
7	One minute power frequency withstand voltage	kV	230
8	Peak impulse test withstand voltage	kV	550
9	Creepage distance	mm/kV	25
9.1	Phase to Phase	mm	1100
9.2	Phase to Earth	mm	1100
9.3	Phase To Phase Spacing	mm	2800
9.4	Minimum Section Clearances	mm	4000
10	Design ambient Temperature	°C	50

2.2 STANDARD VOLTAGE LEVELS:

S.No.	Description	Voltage level
1.	Evacuation and Transmission 110 kV	3 phase, 3 wire 50 Hz, effectively earthed
2.	Station supply	415 V, 3 phase, 4 wire, 50 Hz, effectively earthed.
3.	A.C. Drive motors	415 V, 3 phase, 4 wire effectively earthed

S.No.	Description	Voltage level
4.	Metering 110 V	110 V, AC PT. voltage
5	Control & protection gear	AC 2 wire from UPS
6.	Panel lighting and space heaters	230V, 1 phase, 2 wires, 50 Hz, A.C. with point earthed.

2.3 BASIC INSULATION LEVELS

Sl.No	Nominal voltage kV	BIL kV (peak)
1.	110 kV	550
2.	11 kV	75
3.	400 V	1.1

[3] GENERAL REQUIREMENT

3.1 ALL THE EQUIPMENTS / MATERIALS TO BE SUPPLIED SHOULD BE INACCORDANCE WITH RELEVANT LATEST / AMENDED IS/IEC, WHETHER IT HASBEEN SPECIFICALLY MENTIONED IN THE SPECIFICATION OR NOT.

3.2 Life of the Electro-mechanical generating equipment i.e., turbine, generator, transformers, auxiliaries etc. shall not be less than thirty five (35) years.

3.3 All EQUIPMENTS and type of clamps, fittings hardware, insulators, bus bar. These designs/ drawing shall be got approved by the purchaser before commencing the manufacture/ construction/ erection and are to be as per latest IS/ IEC.

3.4 GENERAL:

The bidder shall be fully responsible for providing all equipment, materials system and services specified or otherwise which are required to complete

the construction and successful commissioning of the substation in all respects.

Any other items not specifically mentioned in the specification but which are required for erection of materials/equipment under the scope of work, testing and commissioning are deemed to be included in the scope of the specification unless specifically excluded.

All items shall be supplied as per schedule and as specified in the relevant Indian standard of latest revision. The Technical specification of the main materials/equipment is furnished. The Technical specification contained herein for the materials are for the guidance of the tenderer.

The bidders are requested to procure the equipment's/materials/component only from reputed /qualified manufacturer as per Technical requirement stipulated in Section-1 of Technical specifications. Approval of make of item shall be taken up by vendor from M/s TANGEDCO himself.

3.5 COMPLETENESS

Bidders may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

All equipment furnished by the Bidder shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

3.6 All the equipment, technological structures, pipes, valves, fittings, etc shall be subjected to inspection and testing as per accepted national or international standards and practices. All the components shall be subjected to inspection and testing as per standard practices of the manufacturer prior to offering them for inspection by the Purchaser /his authorized representative.

3.7 Suitable working platforms, walkways, ladders lifting tackles and tools required for the above shall be provided.

3.8 The fabrication and assembly areas shall be kept clean and free from contamination. During assembly of major components, a polythene covering shall be maintained in position to prevent ingress of dirt, grease, etc from overhead cranes or other equipment.

3.9 All equipment shall be visually inspected in the presence of an inspector immediately before closure. A system of physical identification and accountability shall be used to account for all tools, test equipment, shipping blanks and other items used during assembly to obviate the possibility of their being left inside vessels or equipment.

3.10 CODES & STANDARDS

In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following:

1. Bureau of Indian Standards (BIS)
2. Indian electricity act
3. Indian electricity rules

4. Indian Explosives Act
5. Indian Factories Act and State Factories Act
6. Indian Boiler Regulations (IBR)
7. Regulations of the Central Pollution Control Board, India
8. Regulations of the Ministry of Environment & Forest (MoEF), Government of India
9. Pollution Control Regulations of Department of Environment, Government of India
10. State Pollution Control Board.
11. Rules for Electrical installation by Tariff Advisory Committee (TAC).
12. Any other statutory codes / standards / regulations, as may be applicable.

Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply:

1. Japanese Industrial Standards (JIS)
2. American National Standards Institute (ANSI)
3. American Society of Testing and Materials (ASTM)
4. American Society of Mechanical Engineers (ASME)
5. American Petroleum Institute (API)
6. Standards of the Hydraulic Institute, U.S.A.
7. International Organization for Standardization (ISO)
8. Tubular Exchanger Manufacturer's Association (TEMA)
9. American Welding Society (AWS)
10. National Electrical Manufacturers Association (NEMA)
11. National Fire Protection Association (NFPA)
12. International Electro-Technical Commission (IEC)
13. Expansion Joint Manufacturers Association (EJMA)
14. Heat Exchange Institute (HEI)

Other International/ National standards such as DIN, VDI, BS, etc. shall also be accepted for only material codes and manufacturing standards, subject to the Owner's approval, for which the Bidder shall furnish, along with the offer, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.

In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Owner shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Bidder to bring to the notice of the Owner such changes and advise Owner of the resulting effect.

3.11 LANGUAGE

a. The tender shall be submitted in English language only.

b. In all the technical correspondences English shall be used. Warning & safety notice around the plant shall be in English and Tamil.

c. Plant labels & rating plates and all permanent & temporary notices around the plant shall be in English.

d. Instruction manuals & training programme shall be in English. The visual display unit outputs given by the computer driven data acquisition system shall be in English only.

e. If the offer and all documents are not submitted in English, the tender is liable for rejection. Further, in case the tenderer submits documents in any language other than English along with the translation of the same, such translated documents in English shall be submitted duly authenticating that the translation is true and correct to their knowledge and belief in all such pages by the bidder/ all the consortium partners duly affixing their signatures and seals. In case of foreign bidders, this shall be in addition to the attestation by the Consulate of India

functioning in the respective countries. In case such proper authentication for translated documents is not observed, the tender is liable for rejection.

f. All documents, instructions, catalogues, brochures pamphlets, design data, norms and calculations, drawings, operation, maintenance and safety manuals, reports, labels, on deliveries and any other data shall be in English Language.

g. All correspondence between TANGEDCO and the Contractor shall be in English language.

h. However, all signboards required to indicate "Danger" and/or security at site and otherwise statutory required shall be in English, Tamil & Hindi languages.

3.12 TECHNICAL AND ENGINEERING SERVICES

Technical Services to be provided by the Contractor shall generally include the following amongst others:

a) Material testing, if necessary.

b) Basic design/drawings and layout engineering

c) Detail design/drawings and engineering

d) Drawings/data for carrying out Plant Engineering and detail design including design modification & model testing/ CFD analysis/drawings of civil, structural and services, wherever necessary.

e) Technical services relating to planning, procurement, manufacturing inspection, expediting, packing, shipping, storing, etc.

f) Project management services and complete feedback data and information to TANGEDCO/Purchaser for the same, for the Contractor’s scope of supply and services.

g) Training of TANGEDCO/Purchaser's personnel.

h) Consultancy services, if any, obtained by the Contractor from elsewhere

i) Technical consultation/liaison/guidance relating to detail design a plant engineering by his Sub-Contractors.

j) Supplier's co-ordination relating to site work and other engineering work.

k) Total supervision of dismantling, repair, civil engineering work & erection including specialised erection services.

l) Start-up trial runs, and- commissioning services.

m) Demonstration of performance guarantee tests with the commissioning engineers/specialists.

n) Quality control and adherence to the time schedule control of site work and other Indian works. Time bound project co-ordination relating to customs clearance, transportation, insurance, claim settlement, inspection, construction planning and scheduling dismantling repair & erection planning field construction engineering, cold tests, start up, trial run, commissioning and performance guarantee tests. The contractor shall bring and associate his own and /or his sub-contractor's specialists for the performance of the above mentioned functions.

o) Clearance of installations from the statutory and other concerned authorities on behalf of TANGEDCO/Purchaser, The Contractor shall also assist in preparing application forms, providing necessary drawings, documents test certificates etc including necessary co-ordination with statutory and other concerned authorities.

The Contractor shall be responsible for supply of all the drawings and technical documents & information in respect of the plant &equipment, commissioning spares and also for recommended spares for operation and maintenance. The Contractor shall deliver the drawings, technical documents and information to TANGEDCO and his authorised agency.

3.13 APPROVAL BY TANGEDCO

a. Drawings and documents as per this contract shall be subject to the review and reference of TANGEDCO. Documents and drawings as mentioned in this contract shall be subject to the approval of TANGEDCO.

b. All changes from the approved drawings/documents shall be subject to the prior approval of TANGEDCO.

c. All Sub-Contractors and sub-suppliers for raw materials testing, design and engineering, manufacture, supplies, construction and erection work and any other work/services covered under the Contract shall be subject to the written approval of TANGEDCO.

d. While the Contractor shall make/execute/perform supplies, work and services in terms of the Contract, TANGEDCO shall have the right to check and approve design, type, quality, quantity, materials and workmanship of any or all items of supplies, work and services where considered necessary by TANGEDCO to ensure that supplies, work and services made/executed/ performed by the Contractor are in accordance with the provisions of this Contract.

e. The Chief Project Manager of Contractor who shall be in overall charge of the Project and Site Manager at site shall be appointed in consultation with TANGEDCO.

f. Detailed assignment schedules of foreign Experts/ Specialist for rendering technical services shall be submitted by the Contractor for the approval of TANGEDCO within six months from the effective date off contract. The biodata of key personnel shall be submitted within two months of the effective date of contract and for others six months before their deputation.

g. To enable TANGEDCO to accord approval and to review documents and drawings, the Contractor shall submit back-up data/drawings/basic calculations/assumptions as may be required by TANGEDCO.

h. Where approval of TANGEDCO is required or implied but is not specifically provided for elsewhere in this Contract, such approval shall also come within the purview of this schedule.

i. Approval by TANGEDCO in terms of this schedule shall not relieve the Contractor of any of his obligations under the Contract. TANGEDCO shall approve or refuse approval within 30 (thirty) days from the date of receipt of request with supporting documents.

j. The approval requested by the Contractor shall not be withheld unreasonably by TANGEDCO. All requests for approval shall be accompanied by fully supporting documents, otherwise it shall not be considered as a request.

[4] INSPECTION AND TESTING

4.1 INSPECTION

4.1.1 GENERAL

a) Manufacturing progress review, inspection & testing of equipment covered under the technical specification shall be carried out by the Purchaser at the manufacturers' works/premises prior to dispatch to ensure that their quality & workmanship are in conformity with the contract specifications and approved drawings.

b) These instructions are in addition to provisions laid down in other tender documents of the Purchaser.

4.1.2 INSPECTION & TESTING STAGES AND FINALISATION OF QUALITY ASSURANCE PLAN (QAP)

a) Within 12 weeks of the award of contract the Contractor shall furnish the quality assurance plan as per proforma given to successful tenderer for electrical equipment. separately with suggestive stages and hold points for undertaking inspection and testing by the Purchaser/TANGEDCO. Total list of plant & equipment of the order shall be submitted to the Purchaser/TANGEDCO prior to submission of QAP

b) After receipt, scrutiny and rendering into acceptable mode of above documents, a mutually agreed programme of inspection & testing of equipment shall be finalized with the Contractor by the Purchaser/ TANGEDCO.

c) Inspection & testing of plant & equipment shall be undertaken by the Purchaser / TANGEDCO after finalization & approval of QAP.

4.1.3 RESPONSIBILITY FOR INSPECTION

a) Any inspection by the Purchaser does not replace the responsibility of quality assurance and quality control functions, as expected of the Contractor to be performed by him for supply of plant & equipment as part of the contractual obligations. As such, any approval which the Inspecting Engineer of the Purchaser may have given in respect of plant and equipment and other particulars and the work or workmanship involved in the contract (whether with or without test carried out) shall not bind the Purchaser to accept the plant and

equipment, should it on further test at site be found not to comply with the requirements of the contract.

b) The Contractor is to meet the inspection & testing requirements for the equipment coming under statutory regulations e.g. weights & measures, safety, IE rules, etc. and submit certificates and documents from appropriate authority to Inspecting Engineer for the same.

4.1.3 EXTENT OF INSPECTION

a) The extent of inspection by the Purchaser shall vary from equipment to equipment as per design requirements.

b) However, indicative extent of inspection for electrical equipment is furnished below.

c) Extent of inspection to be carried out shall be finalized with the Contractor after award of the contract on the basis of scope of supply, technical specification and approved GA drawings. However, in case of similar bulk manufactured items, methods of sampling for inspection of different lots shall be governed by relevant Indian or international standards.

d) In case of critical components, the Purchaser reserves the right to undertake 100% inspection.

e) .Categories of Equipment :

1. Bought out items.&
2. Final Inspection & testing

f) Extent of Inspection : (as applicable from equipment to equipment)

i) BOUGHT-OUT ITEMS

Following standard bought-out items shall be accepted on the basis of manufacturers' test certificates:

- LV current transformers
- Standard AC motors
- AC /DC DBs
- Push button station in manufacturer's' standard enclosure
- LT power, control & instrumentation cables and cable termination / jointing kits

- Starters in manufacturer's standard enclosure
- Light fittings
- Field instruments
- Conduits
- Cable trays

ii) FINAL INSPECTION & TESTING:

- Verification of test certificates
- Visual & Workmanship
- Dimensional
- Witnessing of routine tests as per relevant standards. Manufacturers' test certificates for type test to be submitted for verification.
- Witnessing of proto-type tests, as applicable.

4.1.5 TESTS, TEST CERTIFICATES AND DOCUMENTS

a) For each of the items being manufactured, following test certificates and documents (as applicable for each of the equipment) in requisite copies shall be prepared and submitted to the Inspecting Engineer for scrutiny & records.

i) Materials identification & physical and chemical test certificates for all materials except IS:2062 -1992 and FG 150 IS:210-1978 materials used in manufacture of the equipment.

ii) Welding procedures and welder's qualification test certificates, wherever applicable.

iii) Routine/type/calibration/acceptance/special test certificates for electrical items.

iv) Surface preparation and painting certificates.

v) Certificates from competent authority for the items coming under statutory regulations.

b) The Contractor shall be required to produce the specimen and test pieces on which tests were carried-out by his sub-contractors and if called for, samples and specimen shall become the Purchaser's property.

c) Where facilities for testing do not exist in the Contractor/sub-contractor's laboratories or in case of any dispute, samples and test pieces shall be drawn by the contractor/sub-contractor in presence of Inspecting Engineer and sealed

samples shall be sent to any approved laboratories for necessary tests at Contractor/sub-contractor's cost.

d) The Purchaser/TANGEDCO shall have the right to be present and witness all tests being carried out by the Contractor/sub-contractor at their own laboratory or approved laboratories. Also, the Purchaser/TANGEDCO shall reserve the right to call for confirmatory test on samples, at his discretion.

e) Should the result of tests not come within the margin specified, the tests shall, if required, be repeated at Contractor's cost without any liability to the Purchaser

4.1.6 METHOD OF GIVING INSPECTION CALLS

Inspection calls shall be given by the Contractor. All calls shall accompany four sets of relevant test certificates and inspection report of the Contractor/ sub-contractor after satisfactory completion of internal inspection and tests by them as per approved QAP.

4.2 TESTING

4.2.1 GENERAL

a) Test of all equipment shall be conducted as per latest IS. Tests shall also confirm to International Standards IEC/VDE/DIN/BS.

b) All routine tests shall be carried out at manufacturer's works in presence of purchaser or his representative.

c) The tenderer shall submit type test certificates for similar equipment supplied by him elsewhere. In case type test certificates for similar equipment is not available, the same shall be conducted in presence of purchaser or his representative if purchaser so desires, without any financial implications to purchaser. Heat run test based on type test certificate of similar transformer is acceptable.

d) The site tests and acceptance tests to be performed by contractor are detailed below.

e) The contractor shall be responsible for satisfactorily working of complete integrated system and guaranteed performance.

4.2.2 SITE TESTS AND CHECKS

a) All the equipments shall be tested at site to know their condition and to prove suitability for required performance.

b) The test indicated in following pages shall be conducted after installation. All tools, accessories and required instruments shall have to be arranged by contractor. Any other test which is considered necessary by the manufacturer of the equipment, contractor or mentioned in commissioning manual has to be conducted at site.

c) In addition to tests on individual equipment some tests/ checks are to be conducted / observed from overall system point of view. Such checks are highlighted under 'Miscellaneous tests' but these shall not be limited to as indicated and shall be finalized in consultation with TANGEDCO before charging of the system.

d) The contractor shall be responsible for satisfactory working of complete integrated system and guaranteed performance.

e) All checks and tests shall be conducted in the presence of TANGEDCO's representative and test results shall be submitted in six copies to TANGEDCO and one copy to Electrical Inspector. Test results shall be filled in proper proforma.

f) After clearance from Electrical Inspector system/ equipment shall be charged in step by step method.

g) Based on the test results clear cut observation shall be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging, are to be brought by the contractor.

4.2.3 SITE TESTS

The tests to be carried out on the equipment at pre-commissioning stage shall include following but not limited to the following:

a) TRANSFORMER

1. IR test on each winding to ground and between windings.
2. Turns ratio test on each tap.

3. Polarity and vector group test.
4. Measurement of winding resistance.
5. IR, wiring and operational tests on all control devices in control cabinet, oil level indicator, winding and oil temp. indicators, cooling fan etc.
6. Checking of Earthing with respect to transformer tank (flexible from top cover to tank) other parts, neutrals and tank to electrodes of LAs (for LAs located near to transformer).
7. Testing of buchholz relay for alarm and trip conditions.
8. For bushing CTs, tests applicable shall be as for current transformers.
9. Setting of oil/winding temperature indicators, level gauge and checking of alarm/trip circuits.
10. Check insulators for cracks.
11. Checking for oil leakage and arresting of leakages (if there)
12. Checking of operation of all valves.
13. Checking for open position of all the valves (except drain and filter valves).
14. Filtration of oil by using line filter, vacuum pump, and heater set.
15. BDV test on oil samples from top and bottom.
16. Checking of oil for acidity, water content, tan delta etc. as per IS 335.
17. Measurement of magnetizing current and no load loss.
18. Measurement of PI value.
19. Checking of silica gel breather.
20. Checking of noise level at no load and at full load.
21. Checking of air circulation conditions for indoor transformers.
22. Conducting magnetic balance test
23. Checking of other points given in manufacturer's commissioning manual.
24. Back charging of the transformer and checking of voltages at different tap positions.
25. Tan delta Test and SFRA test at site

b) CURRENT TRANSFORMER

1. IR test on each winding, winding to earth and between windings.
2. Checking of winding ratios by primary injection set.
3. Polarity check on each winding.

4. Continuity check for all windings.
5. Check for connections to correct taps.
6. Measurement of knee point voltage and secondary winding resistance for the CTs used for differential protection.
7. Checking of continuity and IR values for cables from CT to Marshalling box.
8. Checking tightness of Earthing connections.
9. Check output after loading of the main circuit.
10. Tan Delta Test.

c) POTENTIAL TRANSFORMER

1. IR test of primary winding by HV megger between windings and earth
2. IR test of secondary winding by LV megger between windings and winding to Earth.
3. Checking of voltage ratio.
4. Verification of terminal markings and polarity.
5. Checking of continuity and IR values for cables from PT to Marshalling Box.
6. Checking tightness of Earthing connections.
7. Checking of insulator for cracks.
8. Check output on charging of the system with connected meters/relays.
9. Tan Delta Test.

d) ISOLATOR / DISCONNECTING SWITCHES

1. IR test by HV Meggar on main poles.
2. IR test on control circuits.
3. Measurement of Contact resistance for all three phases.
4. Functional checking for electrical and manual operation.
5. Checking of interlocking with earth switch and as per write up and checking of earth switch operation.
6. Checking of operation of earth switch.
7. Setting and checking of auto trip operation of motor on complete close / open position of isolator.
8. Testing of overload relay of motor.

9. Checking for remote operation.

10. Checking of operation on minimum and maximum specified voltages (local as well as remote).

11. Checking tightness of Earthing connections.

12. Checking of insulators for cracks.

e) LIGHTNING ARRESTOR

1. Continuity check (for metal oxide type only).
2. Check for connection to ground.
3. Check insulators for cracks.
4. Check reading of leakage current.
5. HT and IR test of each element.

f) INSULATORS

1. Checking of tightness of connection.
2. Check for minor damage / cracks after cleaning.
3. Verification of number of disks as per drawing.
4. Check for Creepage distance on one type of each set.
5. Check heating at termination point during shutdown.

g) NGT

1. Measurement of resistance
2. IR test by HV megger between terminal and earth.
3. Checking of earth connection for terminal and for body
4. Check for isolator operation and continuity of aux. contacts (if applicable)
5. Check for temp. rise of enclosure and current flow in the resistances.

h) LT SWITCHGEAR

1. IR test
2. HV test with 1.1 kV Meggar
3. Functional test for all feeders
4. Testing of all meters

5. Checking and calibration of overload relays and protective relays as per supplier's commissioning manuals.

6. Check operation of contactors from local and remote points
7. Checking of interlocking between incomers/bus coupler and other feeders.
8. Test to prove interchangeability of similar parts

i) PDB / DCDB

1. IR test before and after HT test
2. HV test by 1.1 kV megger
3. Checking for functions of components for each module
4. Checking for interchangeability of similar components
5. Checking of tightness of earth connection.
6. Testing and calibration of all indicating meters
7. Check output of each feeder after energization.

j) AC MOTORS

1. IR test of stator and rotor windings.
2. Check tightness of cable connection
3. Winding resistance measurement of stator and rotor.
4. Check tightness of earth connections.
5. Check space heaters and carryout heating of winding (if required)
6. Check direction of rotation in decoupled condition during kick start
7. Measure no load current for all phases.
8. Measurement of temperature of body during no load and load conditions.
9. Check for tripping of motor from local/remote switches and from electrical/ technological protection including differential protection.
10. Checking of vibration.
11. Checking of noise level.
12. During load running, measurement of stator and bearing temperatures (if applicable) for every half an hour interval till saturation comes.
13. Checking tightness of foundation bolts.
14. Check continuity of temp. detectors.
15. For actuator drives following shall be checked/tested :
    - Visual and dimensional.
    - IR and operation of limit switches.
    - Winding resistance.

k) UNINTERRUPTED POWER SUPPLY

1. Visual check.
2. IR value by megger.
3. Current limit test.
4. Ripple test.
5. Supply variation.
6. Functional test.
7. Capacity test with respect to time.

l) CABLES & CABLES SUPPORTING STRUCTURES

1. Checking of continuity/phasing and IR values for all the cables before and after HV test.
2. HV test and measurement of leakage current after termination of cable kits (for HT cables).
3. Checking of earth continuity for armor and fourth core (if applicable).
4. Check for mechanical protection of cables.
5. Check for identification (tag number system) distance placement of cable marker, cable joint etc. as per the cable layout drawing.
6. Check Earthing of cable structures.
7. Check clearances from ventilation duct and light fittings for cable structures.
8. Check proper fixing of cable structures.

m) INDOOR LIGHTING

1. Check dressing of cable.
2. Measurement of lux level at various places.
3. Check accessibility for replacement of lamps.
4. Checking for black spots or poor visibility near operating and indicating equipments.
5. Check for mechanical protection of cables.
6. Checking for adequacy of emergency DC light.
7. Checking for starting system of periphery lighting.
8. Check for auto switching of battery supply on failure of AC.
9. Checking of Earthing of light panel, socket boards, light fittings.

10. Checking of type of fittings with respect to specification at various locations.
11. Check adequacy of support of fittings.
12. Check water tightness of outdoor located panels.

n) EARTHING

1. Check tightness of all earth connections
2. Check earthling of all metallic equipments, cable trays, Busbar supporting structures, yard fencing steel structures of yard, rails, gates, building column (if steel) all elect. equipments, gas/oil/water pipe lines etc. as per the drawing / specification
3. Measurement of earth resistance for each electrode.
4. Measurement of total earth resistance.
5. Measurement of earth loop resistance for E/F path of biggest LT drive.

o) CONTROL, RELAY & METERING PANELS

1. IR value test by megger
2. Checking of control cable connection.
3. Operational test of all components mounted on control panel.
4. Testing and calibration of indicating meters
5. Testing of all relays including auxiliary relays for their pick up- drop values, operation at all taps (current, voltage and time) etc. as per the manufacturer's commissioning manuals with the help of relay testing kits.
6. Setting of relays as per approved setting table and checking its operation for one below and one upper settings, in the scheme.
7. Measurement of current and voltage in relay operating coils by secondary injection in CT and PT circuit at switchboard.
8. Measurement of current and voltage in relay and meter circuits during loading of the primary circuit/system
9. Testing of all schemes for their functions as per approved drawings
10. Checking stability of differential protection schemes
11. Checking inter changeability of similar equipments
12. Verification of accessibility of all operating points including resetting knob of relays

13. Check operation of each annunciation facias, operation of bell/hooter etc. and sequence of the system
14. Check operation of relays at minimum/maximum control voltage as per the specification
15. Integrated testing of protective relays for operation of master trip relays and tripping of breakers from Operation of master trip relay
16. Check dressing of cables, sealing of openings in gland plate and for provision of double compression glands
17. Check earthling connection of panels, fixing of panels and openings from side and bottom.
18. Checking and adjustment in tri-vector meters as per the manufacturer's instructions.

p) MISCELLANEOUS

1. Checking of continuity of the system
2. Checking of phase sequence from overhead line to consumer end
3. Checking safe accessibility of all operating points
4. Check availability of emergency lighting
5. Check availability of control/aux. supply
6. Ensure availability of first aid box, firefighting equipments, earth discharge rods, rubber mats, rubber glove
7. Check working of ventilation system for battery room - transformer room etc.
8. Check proper covering of cable channels.
9. Placement of shock treatment chart, danger boards, provision of boards indicating 'Man on Work, Do not switch ON', 'Do not switch OFF', 'Earthed', etc.
10. Check proper dressing of cables, mechanical protection of cables, placement of cable markers
11. Check sealing of all cable openings including conduit opening with fire resistance material
12. Check sealing of all openings at bottom of elect. panels.

[5] PAINTING

5.1 GENERAL

a) The primers & finishing paints will conform to latest Indian Standard or equivalent international standards. There shall be of approved quality and shade.

b) General precautions for painting such as preparation of surfaces, application of paints, inspection and testing etc. will be as per relevant clause of IS:1477 (Part I & II) and shall be followed, wherever possible.

c) General compatibility between primer and finishing paints recommended by the paint manufacturer, supplying these paints shall be followed.

d) General compatibility between successive coats must be ensured.

e) Unless otherwise specified, the general color scheme for finishing coats for different types of equipment and pipelines as per requirement of the Purchaser are to be followed. The color schemes, however, may be changed, if necessary, by the Purchaser at any stage before the start of the painting of the equipment.

5.2 PAINTING INSTRUCTIONS

a) In general, unless otherwise specified, all plant and equipment & pipelines will be given one coat of antirust primer, lacquers, etc. at the supplier's works after completing surface preparation to remove grease, rust, scales and other foreign materials. The second coat of antirust primer will be applied immediately after erection after completing requisite surface preparation) followed by two coats of finishing paint of approved quality & shade.

b) Technological structures, crane girders & other structures shall be given one coat of primer during manufacturer & one coat of primer after erection followed by two coats of finishing paint.

c) For equipment where original colour as per supplier's practice is desired, both primer & finishing coats will be applied at supplier's works before dispatch of equipment.

d) Structures embedded in concrete shall have no shop painting applied. The portion of the column that is to be embedded in concrete shall be given a coat of Portland cement slurry after thoroughly cleaning the surfaces from mill scale, grease & oil immediately after fabrication.

e) The portion of the structures embedded underground shall be given two coats of red leadg raphite primer at shop and finished with two coats of bituminous black paint of approved quality.

f) Machined/plained surfaces shall be coated with while lead and tallow before dispatch or before being put into open air & covered with gunny cloth.

g) Surfaces to be site welded shall have no shop paint applied within 100mm of welding zone. After site welding normal painting application will be followed.

h) Areas which become in-accessible after assembly shall be painted before assembly.

i) Cables & other electrical accessories shall have adequate antirust protection.

j) Chequered plates shall be given primer coats only.

k) The phosphate coated surface shall have one coat of baking based and two coats of finished paint of amino alkyd resin stone enamel.

l) External surface of pipe fittings shall be thoroughly cleaned by wire brushing and given two coats of red oxide zinc chromate primer at supplier's works & two coats of final synthetic enamel paint after erection.

m) The equipment which are to be dispatched in knocked down condition and require assembling at site, shall be given two coats of rust and corrosion preventive primer and one coat of synthetic enamel paint of approved quality and shade. After assembly at site, such equipment shall be given one final coat of synthetic enamel paint.

n) The equipment which can be sent as a single block unit duly shop assembled, shall be given full application of paint i.e. two primer coats of rust and corrosion preventive primer and two finish coats of paint of approved quality and shade as per relevant Indian Standards/equivalent international standards.

o) All painting shall be carried out by brushing or roller application with prior permission of the Purchaser.

p) All metal parts not accessible for painting shall be made of rust and corrosion resisting materials. Interiors of equipment will be suitably quoted with anti-rust compounds.

q) The fasteners shall not be painted. These will be dispatched with application of anti-rust compound.

r) Any special painting requirement indicated on the Contractor's drawings by the Purchaser during approval stage shall be binding.

5.2 SURFACE PREPARATION AND ENVIRONMENTAL CONDITIONS

a) All surfaces to be painted shall be thoroughly cleaned of dirt, grease, rust & mill scale.

Removal of rust & scale shall be by hand brushing, power driven wire brushes or by sand blasting, as the surface condition/service condition warrants.

b) The paint shall be applied on the metallic cleaned surface after it is perfectly dry but not later than 3 hours after cleaning of the surfaces. Reasonable time gap should be allowed between any two consecutive coats of primer or finishing coats.

c) Surfaces coming in contact with acid & acidic fumes alkalis, soda, detergents etc shall be cleaned thoroughly to get complete metallic surface as per IS;1477 Part I & II or BS 4232-1967. After sand blasting the surface shall be cleaned with cotton rags, soaked in benzene, to remove fine rust, grease, etc. No sand blasted surface shall be exposed to weather for more than 3 hours.

d) The choice of primer & finishing paint will depend on the environmental condition to which the plant & equipment & pipelines are exposed to.

e) Paints are to be applied on dry surface only under agreeable weather conditions. Painting in damp & foggy weather conditions will not be permitted.

f) For a selected primer the method of surface treatment best suited for that primer & suggestion of paint manufacturer shall be obtained and followed.

g) Zinc rich primer paints which have been exposed for a long time before the finishing coat is applied shall be washed down thoroughly to remove soluble zinc salt deposit.

h) The recommendation of paint manufacturer shall be forwarded to the Purchaser for approval.

5.2 PRIMER PAINT

a) In general, two coats of primer paints conforming to relevant Indian Standard or equivalent international standards shall be applied on all unmachined surfaces, except noted otherwise.

b) Where equipment is to be finish painted for dispatch, both coats will be applied before finishing coats at supplier's works.

c) Where equipment warrants finishing coat after erection, one coat will be applied just after manufacture at supplier's works and the second coat just after erection at site after surface cleaning.

d) Equipment on which primer coat has been damaged due to prolonged exposition at site, final erection or transport, shall be given two coats of primer at site before applying finishing coats. Before applying paint the surface will be thoroughly cleaned by sand paper.

e) The primer applied should be compatible in quality and colour schemes with the subsequent finishing coats.

f) Unless stated otherwise, the following primer paints shall be used depending upon the exposition and environmental condition to which the plant & equipment, structures & pipelines are exposed to :

- Aluminium zinc oxide - conforming to IS;2931
- Red oxide zinc chromate - conforming to IS;2074
- Heat resistant aluminum - conforming to IS:161 primer paint
- Air drying chemical resistant paint
- Epoxy resin paint (cold cured) -
- Poly urethene paint
- Chlorinated rubber based conforming to DEF-1402, Ministry of Defense

5.3 PRIMER PAINT

a) Two coats of finishing paint compatible with the primer and conforming to relevant Indian

Standard or equivalent international standards shall be applied on all un-machined surfaces

unless mentioned otherwise.

b) Unless noted otherwise, the following finishing paints will be applied on plant & equipment,

structure & pipelines depending upon the exposition and environmental conditions to which the plant & equipment, structures & pipelines are on subjected to:

- Synthetic enamel conforming to IS; 2932 exterior type
- Epoxy based finishing paint -
- Heat resistant silicon based Aluminium paint IS:161

c) The finishing paint shall be of approved colour. The undercoat shall have different tinge to distinguish from the finishing paint.

d) The surfaces of the equipment on which finishing coats of paint has been damaged due to prolonged exposition at Contractor's work, erection site, during transport, storage or final erection shall be thoroughly cleaned & touched up with the same paint as applied previously.

5.3 THICKNESS OF COAT OF PAINT

a) A single coat of paint when dry should have a thickness of 25 to 30 microns (0.025 to 0.030 mm) or 1 mil to 1.25 mils.

b) Total thickness of 4 coats (2 primer coats + 2 finishing coats) should have thickness of 100 to 125 microns (0.100 to 0.125 mm) or 4 to 5 mils.

c) In case of bituminous aluminum gilsonite based paint 3 coats are to be applied. The total thickness of 3 coats will be not less than 100 microns (0.100 mm) or 4 mils.

d) Immediately following the award of the Contract, the Contractor shall submit the names of the proposed paint supplier and applicator together with a quality assurance program for approval. All paints for one section shall be provided by one manufacturer and preferably shall be manufactured in one country to ensure compatibility.

[6] GENERAL REQUIREMENT

6.1 GENERAL

a) Name of coordinators with address, telephone/FAX numbers for all sub-contractors, pertaining to electrical job.

b) List of equipment/tools and manpower proposed to be arranged for installation erection and site handling of the equipment.

c) Name of site in-charge with office/ organization and date of opening of site office.

d) Quality control manuals

e) Detailed list of drawings and documents containing information on current state of the project.

f) Monthly progress report furnishing status of

- Planning
- Manufacture
- Transport
- Erection
- Testing & commissioning

6.2 FOR APPROVAL

A. CALCULATIONS

1. Relay settings with calculations and graph for justification of all relay settings (current, voltage and time).
2. Calculation to justify generator CT/PT parameters like VA burden, knee point voltage etc. for all cores.
3. Calculations for Required battery capacities of the UPS system.
4. Calculations for voltage drop and short time rating of cables to prove adequacy of sizes.
5. Calculation for Neutral grounding transformer and secondary resistance.
6. Calculation of lux levels of Control Room, Machine hall and other floors
7. Calculations for short time withstand of transformers.

8. Calculations for design of supporting structures for outdoor switchyard regarding wind pressure, short circuit forces etc.

B. OTHERS

1. Single line diagram indicating transformers, breaker, CT/PT, all relays, meters, LA, cable sizes, details of CT/PT ratio, VA burden, Vk value, type and make of all relays, their range, nominal and short time ratings of bus bars, etc. for all equipment.
2. Front view and GA diagrams for all panels.
3. Control and schematics drawings for local/remote control/protection for each equipment and drives.
4. Drive list.
5. Synchronization schemes.
6. Auto change over arrangement.
7. Logic diagrams for start/stop of various mechanism/drives.
8. Lighting layout for Control Room and other areas. Type of fittings, wiring arrangement, switching of fittings and single line diagram from board to fittings.
9. Details of protection logic (class A,B&C tripping) indicating list of electrical and mechanical protection leading to tripping of turbine generator, field breaker, etc.
10. Equipment Earthing layout drawing
11. Electrical equipment layout for all electrical premises.
12. Cable structure layouts with size of structures for gallery and cable channels of different places
13. Sequence of inspection plan and despatch of materials to site.
14. List of drawings, numbering system, size, proposed date of submission (To be submitted just after LOI).
15. Installation drawings of all equipment with

- Layout of equipment
- Layout of Cabling
- Illumination drawings
- Earthing Layout.

6.3 FOR INFORMATION

1. Details of painting for all equipment
2. Bus wire arrangement for control/signal/annunciation and heater supplies of control panels and switch boards.
3. Cable schedule indicating type of cables, from to via. route, total length, size of each cable and a final summary sheet indicating total requirement of all types of cables (for control and power both).
4. Core wise control cable termination details indicating ferrule no./terminal block no. for each cable/each equipment.

5 Internal wiring diagrams for all panels.

6. VI characteristics and RCT values of CTs used in differential protection.
7. Cable layout drawings.
8. Technical particulars of all LT motors and recommended protection.
9. Catalogues for each type of equipment, relays, meters etc.
10. Installation and commissioning manuals for each equipment, relay etc.
11. Operation and maintenance manuals indicating trouble shooting procedure for all equipment.
12. Type test certificates for all the major equipment.
13. Details of test results conducted at works for all equipment in bound Volume
14. Details of test results conducted at site for all equipment in bound Volume
15. Spare part list number and ordering procedure for all recommended spares.
16. Details of transport arrangement and maximum size of transportable section (weight and overall dimensions).
17. Details of agency proposed to be fixed for doing erection commissioning job.
18. Panel wise bill of material indicating type make and brief technical particulars of all items/ accessories mounted on the panels.
19. Overall GA of all the panels/equipment
20. Fixing details of all the panels/equipment, supporting structures, etc.
21. Heat loss for each equipment.

22. Static and dynamic loading of each equipment
23 Floor cutouts and wall opening details for cables bus duct, air conditioning ducts, light conduits, exhaust fans etc.
24. Details and location of various inserts base plates, bolts etc. required to be provided for support of cable structure, bus duct electrical panel, etc.
25. Conduit layout drawing indicating type, size, length and locations of conduits required to be placed in RCC wall/floor, brick wall.
26. Technical data sheet for each type of motors and characteristic curves for protection settings.
27. As built drawings incorporating site changes along with soft copies in CD.

ANNEXURE-A

COMPLIANCE CERTIFICATE OF TECHNICAL SPECIFICATION

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation(s) with respect to specification other than those furnished in the 'schedule of deviations'.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

Date: Bidder's Stamp & Signature

ANNEXURE – B

SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Section/ Page No.	Clause No.	Deviation	Reason / Justification

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date: Tenderer's Stamp & Signature

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

1.	For any **technical clarification**, please contact Mr. Vyom Kumar, Dy. Manager (TBEM). Contact No. 0120-06748597; e-mail: vyom@bhel.in	
2.	For any **commercial clarification**, please contact Mr. Sandeep, Dy. Manager (TBMM). Contact No. 0120-6748540; e-mail: kumar.sandeep@bhel.in	
3.	**Terms of Payment:**	
(Supply & Services)	As per GTC of GeM (Payment due date shall be as per GEM) Supply Payment: a) 95% of payment from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows: • LR / GR duly endorsed by BHEL Site Official. • Material Receipt Certificate issued by BHEL Site Official. • GST Compliant Tax Invoice • Packing List (Case-wise) • Copy of Transit Insurance Certificate from underwriters. • Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management • Guarantee Certificate • Copy of Performance Bank Guarantee (PBG) • Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order b) 5% of payment days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows: • Certificate of successful completion of Supervision of Erection, Testing & Commissioning at Site if it is in the scope of the supplier or Certificate of successful completion of Testing & Commissioning at Site if it is in the scope of the supplier. • Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management **Note:** In-case commissioning is delayed beyond reason not attributable to supplier. Supplier may claim the balance 05% of supply portion after 12 months from the date of last delivery upon submission of BG with equivalent amount and the certificate endorsed by BHEL Site In-Charge citing the details that the “delay in commissioning is not attributable to supplier”. ***Vendor has to submit the duly signed check-list along with Bill.*** **Payment terms for supervision of ETC:** 100% payment along with applicable GST from the date of receipt of complete GST compliant Tax invoice along with certificate of successful completion of Testing & Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies). **Note:** Service charges like Supervision should not exceed 2% of the total contract value.	
4.	**Terms of Delivery:**	
As per GeM. However, unloading at site is in the scope of BHEL. Bidders to quote price accordingly.		

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

5.	**Delivery Time:**
33 Weeks (231 days) from the date of PO by BHEL as per Activity schedule (Annexure-A). Early Delivery is acceptable. **Note:** In case, BHEL's delivery requirement is not met by vendor(s), then a chance may be given to all such vendors to review their quoted delivery schedule in line with BHEL's delivery requirement. However, if vendor fails to meet the requisite delivery plan, then BHEL reserves the right not to consider the offer of such vendor(s).	
6.	**Prices:**
The quoted prices shall be on **Firm basis including packing and forwarding charges**. Price to be quoted as inclusive of GST. i.e. Ex-Works + F&I + GST.	
7.	**Liquidated Damage of delayed Delivery:**
As per GeM terms and conditions.	
8.	**Item & BOQ:**
BOQ: As per Clause No. 5 of Section-1 of Technical specification.	
9.	**Technical Specification:**
Technical specification no**. TB-417-316-102 Rev-00.** No permissible Technical Deviation has been envisaged. Bidders to quote as per Technical Specification.	
10.	**Pre-Qualification Requirement:**
As specified in Technical Specifications	
11.	**MQP (Manufacturing Quality Plan):**
MQP format is indicative only, however inspection shall be carried out as per approved Quality Plan. Supplier has to submit Quality Plan to BHEL for Customer approval.	
12.	**Inspection:**
Inspection shall be carried out as per customer as per approved Quality Plan.	
13.	**Destination / Delivery Location**:
Stores Officer Kodayar Sub Store Kodayar Lower Camp, Kanyakumari District, Pin Code: 629102, GSTIN 33AADCT4784E1ZC	
14.	**Bill to Address:**
Bharat Heavy Electricals Limited-TBG, 10th Floor, Plot No.C-20/1A/1, Joy Tower, Sector-62, Noida-201301, U.P. **GSTN-**09AAACB4146P2ZC	

15.	**Guarantee Clause (Defect Liability Period):**
The equipment / material supplied and services rendered (if applicable) shall be guaranteed to be free from all defects and faults in design & engineering, material, workmanship & manufacture and in full conformity with the Purchase Order / Contract, Technical Specifications & approved drawings / data sheets, if any, "Twenty-Four (24) months from the date of taking over of the Facilities (10.01.2024) or twelve (18) months from the date of last delivery (or any part thereof), whichever is later".	
16.	**Performance Bank Guarantee:**
Performance BG to be kept valid till the completion of guarantee period i.e. **Twenty-Four (24) months from the date of taking over of the Facilities (10.01.2024) or twelve (18) months from the date of last delivery (or any part thereof), whichever is later"**.	

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

"Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms and conditions defined in NIT / Contract, from the bills along with due interest."	
17.	Bidders to ensure that Third party / customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document / certificate issuing authority such as name & designation of Issuing Authority and its organization contact number and e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.
18.	**Acceptance of Offer:**
Bidder's offer will be technically acceptable subject to final acceptance of vendor by ultimate customer as approved supplier. Price Bid will be opened only for those bidders in respect of which vendor approval is received from TANGEDCO Kodyar. Necessary credentials/documents to be submitted for approval by Customer as per format.	
19.	**Deviations:**
a) Technical Deviation: No Technical Deviation is envisaged. b) Commercial Deviation: No Commercial Deviation is envisaged.	
20.	All other terms & conditions shall be as per GTC of GeM

Signature & Seal of supplier

Date

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

ACTIVITY SCHEDULE FOR MAIN ITEMS

Annexure-A

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS
1.	Submission of documents necessary for getting manufacturing clearance Drawings, data sheets (In scope of vendor)	04
2.	Review and Approval of documents and issue of manufacturing clearance (In scope of BHEL)	06
3.	Manufacturing Time (In scope of vendor)	20
4.	Inspection (In scope of BHEL)	01
5.	Issue of MICC (In scope of BHEL)	01
6.	Dispatch (In scope of vendor)	01
7.	Supervision activity considered from the date of PO/Contract (33 Weeks for supply + 07 Weeks for site readiness + 12 Weeks for services)	52 Weeks

Note – 1 - Supplier to ensure every revised submission incorporating comments within 2 weeks from the date of comments by BHEL.

1. Inspection call to be issued 2 weeks in advance.
2. Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier.
3. Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.

Signature & Seal of Supplier
Date

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

Annexure-V

Item/Package Name :	**Supply & Supervision of ETC for Isolators**
Enquiry No.:	
Project:	**TSGENCO Kodyar**
Type of project	**Hydro**
Percentage of Local Content	***(Bidder to enter the applicable % of local content)***

Format of Self certification regarding Local Content in line with PPP-MII order, 2017 & its revision dated 04.06.2020.

Date:……

I _____S/o, D/o, W/o, _____Resident of _____ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 (*hereinafter PPP-MII order*) of Government of India issued vide Notification No: P-45021/2/2017-BE-II dated 15/06/2017, its revision dated 04/06/2020 and any subsequent modifications/Amendments**,** if any**.**

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring entity/BHEL or any other Government authority for the purpose of assessing the local content of goods/services/works supplied by me for …… *(Enter the name of the Equipment/Item for Project)*.

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

That the goods/services/works supplied by me for …… (Enter the name of the Equipment/Item for Project) contains…….% (mention the Local content in %age) Local Content.

That the value addition for the purpose of meeting the 'Minimum Local Content 'has been made by me at …… (*Enter the details of the location(s) at which value addition is made)*.

That in the event of the local content of the goods/services/works mentioned herein is found to be incorrect and not meeting the prescribed supplier class categorization criteria as per said order, based on the assessment of procuring agency (ies)/BHEL/Government Authorities for the purpose of assessing the local content, action shall be taken against me in line with the PPP-MII order and provisions of the Integrity pact/ Bidding Documents.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.

i. Name and details of the Local Supplier
(Registered Office, Manufacturing unit location, nature of legal entity)
ii. Date on which this certificate is issued

Annexure-V

iii. Goods/services/works for which the certificate is produced

iv. Procuring entity to whom the certificate is furnished

v. Percentage of local content claimed and whether it meets the Minimum Local Content prescribed

vi. Name and contact details of the unit of the Local Supplier (s)

vii. Sale Price of the product

viii. Ex-Factory Price of the product

ix. Freight, insurance and handling

x. Total Bill of Material

xi List and total cost value of input used to manufacture the Goods/to provide services/in construction of works

xii. List and total cost of input which are domestically sourced. Value addition certificates from suppliers, if the input is not in-house to be attached

xiii. List and cost of inputs which are imported, directly or indirectly

For and on behalf of…… (Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)
<Insert Name, Designation and Contact No.>

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

SCHEDULE OF COMMERCIAL DEVIATION

The following are the deviations/ variations exception from the General Terms and Conditions:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

Note : 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

This Format is to be submitted in original duly signed by bidder. Reproduction of the same in any sort is not acceptable.

Signature of the authorized representative of

Place: é é é é é é é

Bidder's name
Date : é é é é é é é .
:é é é é é é é é é é é é é é é
Designation:é é é é é é é é é é é é é é é
..
Company
Seal:é é é é é é é é é é é é é é

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations/ variations exception from the Technical Specifications:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Technical Specifications,

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

Note : 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

This Format is to be submitted in original duly signed by bidder. Reproduction of the same in any sort is not acceptable.

Signature of the authorized representative of

Place: é é é é é é é .
Date : é é é é é é é .

Bidder's name :é é é é é é é é é é é é é é é
Designation:é é é é é é é é é é é é é é é ..

PROJECT:	**TANGEDCO Kodyar**
ITEM:	**Supply & Services of ISOLATORS**
SUBJECT:	**BID SPECIFIC ATC**

UNPRICED BID

Item No.	Item Description	Item Quantity	Unit of Measure	Unit Price (Inclusive of F&I & GST)	GST % Applicable
1	SUPPLY- ISOLATOR: 110KV, 1250A, 40KA FOR 3S, THREE PHASE, DOUBLE BREAK /VERTICAL KNEE TYPE STRUCTURE MOUNTED THREE POLE MECHANICALGANGED MOTOR OPERATED, ELECTRICALLY OPERATED WITH ONE EARTH SWITCH, THREE POLE MECHANICAL GANGED MOTOR OPERATED, ELECTRICALLY OPERATED, ALONG WITH MOTOR OPERATED MARSHALLING BOX, OPERATING ROD INSULATORS & OTHER ACCESSORIES, BUT WITHOUT INSULATOR, STRUCTURE & TERMINAL CONNECTOR ETC., CREEPAGE AS PER TECHNICAL SPECIFICATION	02	SET	Mention as "Quoted"	Mention GST %
2	SUPPLY- ISOLATOR: 110KV, 1250A, 40KA FOR 3S, THREE PHASE, DOUBLE BREAK /VERTICAL KNEE TYPE STRUCTURE MOUNTED THREE POLE MECHANICAL GANGED MOTOR OPERATED, ELECTRICALLY OPERATED WITHOUT EARTH SWITCH, ALONG WITH MOTOR OPERATED MARSHALLING BOX, OPERATING ROD INSULATORS & OTHER ACCESSORIES, BUT WITHOUT INSULATOR, STRUCTURE & TERMINAL CONNECTOR ETC., CREEPAGE AS PER TECHNICAL SPECIFICATION	03	SET	Mention as "Quoted"	Mention GST %
3	SUPPLY- ISOLATOR : FLEXIBLE BRAIDED COPPER ALONG WITH LUGS FOR EARTHING (1 SET= QUANTITY REQUIRED FOR 1 SET OF ISOLATOR WITH ONE EARTH SWITCH/ WITHOUT EARTH SWITCH)	05	SET	Mention as "Quoted"	Mention GST %
Supervision of ETC					
Item Number	**Item Description**	**Item Quantity**	**Unit of Measure**	**Unit Price (Inclusive of GST)**	**GST % Applicable**
4	SERVICES- ISOLATOR : 110KV, SUPERVISION OF ERECTION TESTING AND COMMISSIONING INCLUDING ALIGNMENT CHECK OF THREE PHASE, DOUBLE BREAK / VERTICAL KNEE TYPE ISOLATOR	05	LOT	Mention as "Quoted"	Mention GST %

Signature & Seal of Supplier
Date: