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3.19.5 QUALITY CO-ORDINATION PROCEDURE

The purpose of this document specifies the procedure to be adopted for coordination of QA & I Activities. Refer QUALITY CO-ORDINATION PROCEDURE enclosed as Annexure-C.

3.20 PROJECT MANAGER'S SUPERVISION

- 3.20.1 To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Arbitration' clause in Section GCC, Section-IV; the Contractor shall proceed to comply with the Project Manager's decision.
- 3.20.2 The work shall be performed under the supervision of the Project Manager. The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:
- a) Interpretation of all the terms and conditions of these documents and specifications:
 - b) Review and interpretation of all the Contractor's drawing, engineering data, etc:
 - c) Witness or his authorised representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract :
 - d) Inspect, accept or reject any equipment, material and work under the contract:
 - e) Issue certificate of acceptance and/or progressive payment and final payment certificates:
 - f) Review and suggest modifications and improvement in completion schedules from time to time ; and
 - g) Supervise Quality Assurance Programme implementation at all stages of the works.

3.21 TYPE TESTING , INSPECTION, TESTING & INSPECTION CERTIFICATE

- 3.21.1 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.

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- 3.21.2 The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.
- 3.21.3 The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.
- 3.21.4 The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
- 3.21.5 When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests, or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.
- 3.21.6 In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.
- 3.21.7 The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.
- 3.21.8 To facilitate advance planning of inspection in addition to giving inspection notice, the Contractor shall furnish quarterly inspection programme indicating schedule dates of

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inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

- 3.21.9 All inspection, measuring and test equipments used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipments in the presence of Project Manager / Inspector.
- 3.21.10 Associated document for Quality Assurance programme:

List of items requiring quality plan and sub-supplier approval: QS-01-QAI-P-1/F3-R0
(Annexure-D)

Manufacturing Quality Plan Format no. (Annexure-E) : QS-01-QAI-P-09/F1-R1

Field Quality Plan Format no. (Annexure-F) : QS-01-QAI-P-09/F2-R1

3.21.11 PRE-COMMISSIONING AND COMMISSIONING FACILITIES

- a) On completion of erection of the equipment and before start-up, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Owner and the contractor for correctness and completeness of installation and acceptability for start-up, leading to initial pre-commissioning tests at site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the contractor's quality assurance programme as well as those included in elsewhere in the Technical Specifications.
- b) The contractor's pre-commissioning/commissioning/start-up engineers, specially identified as far as possible shall be responsible for carrying out all the pre-commissioning tests at site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over the complete equipment shall be placed on initial operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.
- c) All piping system shall be flushed steam blown as required and cleanliness demonstrated using acceptable industry standards procedures to accomplish this work shall be submitted for approval to the Owner six months prior to the respective implementations. The Owner will approve final verification of cleanliness.
- d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.
- e) The check outs during the pre-commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Owners commissioning (start-up) Engineer(s) should be checked out and cleaned. The checking and inspection of individual system should then follow a prescribed schedule to be agreed by Owner.

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3.22 PACKAGING & PROTECTION

3.22.1 PACKING, MARKING AND SHIPPING

The packing and shipping shall be carried out in accordance with the standard practice of Contractor and with the following additional requirements:

- a. The equipment shall be prepared in such a manner as to protect the equipment from damage or deterioration during shipping or storage. The shipments can be exposed to heavy rains, hot sun, high humidity and sudden extreme changes of temperature. The equipment shall be packed and shipped so as to protect it from all such conditions and any other abnormal conditions, generally expected during shipping & storage.
- b. The metallic containers, if any, shall be considered as the property of the Contractor and he will be allowed to remove them from site once the contents are unpacked, inspected, documented and placed in temporary storage or in final position.
- c. The equipment shall be shipped in such a manner as to facilitate unloading, handling and storage enroute and at the site. The Contractor shall provide lifting lugs and special lifting devices for proper handling and erection.
- d. The Contractor shall be liable for any damage or loss resulting due to careless, improper, poor or insufficient packing and handling.
- e. Spare parts and spare equipment shall be packed separately in containers adequate for long term storage, plainly marked "Spare Parts Only". They shall be crated individually or in kits to be used in one single renewal or overhaul operation. Other spare part kits shall not be disturbed when using one set or kit.
- f. The Contractor shall at all times protect and preserve from damage, loss, corrosion and all other forms of damage, all parts of the works.

g. PACKING IN CRATES

For the equipment packed in crates, the packing wood shall be as per relevant Indian/ International standards. The base of the crate shall be made of wooden batons and planks giving necessary reinforcement, so that the bottom of the equipment is at a height of 100mm minimum from the ground level. The size of the plank shall be decided by the sub-contractor to suit the weight of equipment. Minimum thickness of the plank shall be 25mm and minimum width shall be 150mm. Crate shall be made while keeping the gap from 25mm to 200mm depending upon the size of equipment and weight. However, the responsibility of proper packing and safe delivery of the equipment to site lies with the supplier

3.22.2 TRANSPORTATION

- a. The Contractor shall make a careful examination of access rail/roadways to the site in order to confirm the practical maximum transport weight and dimensions as well as a careful examination of the ports of disembarkation particularly with respect to the capacity of the cranes installed and access roads.
- b. All instruments and computer/microprocessor based equipment imported into India from overseas for the purpose of this contract shall be air freighted to the nearest possible point and further by rail/road taking due precautions

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as per manufacturer's recommendations. Employer shall have the right to decide the items that should be air freighted and Employer's decision shall be binding on Contractor

3.22.3 INSURANCE

- a. The Contractor shall insure all shipments and works at his own expense for not less than the full replacement cost plus any additional cost for accelerated manufacturing of the replacement parts.
- b. Loss or the damage to equipment during shipping or transportation to the site(s) or otherwise shall not constitute grounds for claims for extension in time or for extra payment.

3.22.4 STORAGE OF EQUIPMENT

- a. The Contractor shall provide and construct adequate storage sheds for proper storage of equipment. Sensitive equipments shall be stored indoors. All equipment during storage shall be protected against damage due to act of nature or accidents. The storage instructions of the equipment manufacturers shall be strictly adhered to.
- b. The necessary transport packing shall be removed as soon as possible after receipt of equipment at the work site(s).

3.23 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

- 3.23.1 The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of IS:617 for connecting to equipment terminals and conductors of aluminium. In case the terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetallic liner.
- 3.23.2 The material of clamps and connectors shall be Galvanised mild steel for connecting to shield wire.
- 3.23.3 Bolts, nuts and plain washers shall be hot dip galvanised mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanised mild steel. The spring washers shall be electro-galvanised mild steel.
- 3.23.4 All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be rounded off to meet specified corona and radio interference requirements.
- 3.23.5 They shall have same current rating as that of the connected equipment. All current carrying parts shall be at least 10 mm thick. The connectors shall be manufactured to have minimum contact resistance.
- 3.23.6 Flexible connectors, braids or laminated strips shall be made up of copper/aluminium.
- 3.23.7 Current rating and size of terminal/conductor for which connector is suitable shall be put on a suitable sticker on each component which should last atleast till erection time.

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3.24 ELECTRICAL EQUIPMENT/ENCLOSURES

All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified elsewhere in the specifications.

3.25 CASTING

All castings shall be true to pattern, free from defects and of uniform quality and condition. The surface of castings, which do not undergo machining, shall be free from foundry irregularities. The casting shall be tested for NDT, chemical, mechanical and metallographical tests. This shall be specified in quantity plan for the specific equipment. Iron casting material shall be in accordance with ASTM A 126 class B. Steel casting shall be manufactured in accordance with ASTM A 27 and shall be subject to appropriate tests and inspection.

3.26 FORGINGS

If requested by purchases, forging shall be tested by magnetic particle, dye penetration, radiographic, ultrasonic or any combination of methods, which may suit material type and forging design. The testing is to be carried out according to appropriate ASTM standards. The forging shall be tested for mechanical and metallographical tests as per ASTM.

3.27 FABRICATED COMPONENTS

All components machined or fabricated from plate, sheet or bar stock shall meet the material requirements of ASTM. Structural steel, rolled shapes, bars etc. shall comply with the latest ASTM for A36.

All or a representative number of such components shall be subjected to one or more of the tests: visual, dye penetration, magnetic particle (transverse and longitudinal), ultrasonic or radiograph. These tests shall be in accordance with the ASTM. The acceptance shall be as per ASTM Specifications.

3.28 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT

3.28.1 All types of control cabinets, junction boxes, marshaling boxes, lighting panels, terminal boxes, operating mechanism boxes, Kiosks etc. shall generally conform to IS:5039, IS:8623 and IEC:439 as applicable.

3.28.2 They shall be of painted sheet steel or aluminium. The thickness of sheet steel shall be 2mm cold rolled or 2.5mm hot rolled. The thickness of aluminium shall be 3mm and shall provide rigidity. Top of the boxes shall be sloped towards rear of the box. The paint shall be of grey RAL 9002 on the outside and glossy white inside. However, the junction and switch boxes shall be of hot dip galvanised sheet steel of 1.6mm thickness.

3.28.3 The cabinets/boxes/kiosks/panels shall be free standing or wall mounting or pedestal mounting type. The bottom part of all boxes shall be mounted atleast 1000mm from

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ground. They shall have hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.

- 3.28.4 The degree of protection of all the outdoor boxes shall not be less than IP 55 as per IS 2147.
- 3.28.5 The cable entry shall be from bottom, for which removable gasketed cable gland plates made of 3mm thick sheet steel shall be provided.
- 3.28.6 Suitable 240V, single phase, 50Hz ac heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10deg. above the ambient.
- 3.28.6.1 The size of enclosure and the layout of equipment inside shall provide generous clearances. Each cabinet/box/kiosk/panel shall be provided with a 15A, 240V ac, 2pole, 3 pin industrial grade receptacle with switch. For incoming supply, MCB of suitable rating shall be provided. Illumination of each compartment shall be with door operated incandescent lamp. All control switches shall be of rotary switch type.
- 3.28.6.2 Each cabinet/box/kiosk/panel shall be provided with two earthing pads to receive 75mmx12mm GS flat. The connection shall be bolted type with two bolts per pad. The hinged door shall be connected to body using flexible wire. The cabinets/boxes/kiosks/panels shall also be provided with danger plate, and internal wiring diagram pasted on inside of the door. The front label shall be on a 3mm thick plastic plate with white letters engraved on black background

3.29 TERMINAL BLOCKS

- 3.29.1 They shall be non-disconnecting stud type of extensible design equivalent to Elmex type CAT-M4.
- 3.29.2 The terminal blocks shall be of 1100 V grade, and rated to continuously carry maximum expected current. The conducting part shall be tinned or silver plated.
- 3.29.3 They shall be of moulded, non-flammable thermosetting plastic. The material shall not deteriorate with varied conditions of temperature and humidity. The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating plastic material. Insulating barriers shall be provided between the terminal blocks so that the barriers do not hinder the wiring operation without removing the barriers.
- 3.29.4 The terminals shall be provided with marking tags for wiring identification.
- 3.29.5 Unless otherwise required (expected current rating) or specified, terminal blocks shall be suitable for connecting the following conductors on each side:
All CT & VT circuits - Min. four 2.5 sq.mm. copper flexible conductor
AC & DC power supply - Two 16 sq.mm. aluminium conductor
Circuits
Other control circuits - Min. two 2.5 sq.mm. copper flexible conductor

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3.29.6 The terminal blocks for CT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary leads shall also be provided with short-circuiting and earthing facilities.

3.30 Wiring

- 3.30.1 All wiring shall be carried out with 1100 V grade stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows:
- a) All circuits except CT circuits 2.5 sq.mm
 - b) CT circuits 4 sq. mm (minimum number of strands shall be 3 per conductor).
- 3.30.2 All internal wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals and terminal blocks.
- 3.30.3 Wire terminations shall be made with solderless crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires shall not fall off when the wires and shall not fall off when the wire is disconnected from terminal blocks.
- 3.30.4 All wires directly connected to trip circuit breaker shall be distinguished by the addition of a red coloured unlettered ferrule. Number 6 & 9 shall not be included for ferrules purposes.
- 3.30.5 All terminals including spare terminals of auxiliary equipment shall be wired upto terminal blocks. Each equipment shall have its own central control cabinet in which all contacts including spare contacts from all poles shall be wired out. Interpole cabling for all equipment's shall be carried out by the Contractor.

3.31 CABLE GLANDS AND LUGS

- 3.31.1 Cable glands shall be Double compression type, tinned/Nicked plated (coating thickness not less than 20 microns in case of tin and 10 to 15 microns in case of nickel) brass cable glands for all power and control cables. They shall provide dust and weather proof terminations. They shall comprise of heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and off tested quality. Required number of packing glands to close unused openings in gland plates shall also be provided.
- 3.31.2 The cable glands shall be tested as per BS:6121. The cable glands shall also be duly tested for dust proof and weather proof termination.
- 3.31.3 Cables lugs shall be tinned copper solder less crimping type conforming to IS:8309 and 8394 suitable for aluminum or copper conductor (as applicable). The cable lugs shall suit the type of terminals provided. The cable lugs shall be of Dowell make or equivalent.

3.32 CONDUITS, PIPES AND ACCESSORIES

- 3.32.1 The Contractor shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes, etc. including all necessary sundry materials, such as tees, elbows,

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check nuts, bushing reduces, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes, etc.

3.32.2 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate conversion coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/ pipes shall be of a reputed make.

3.32.3 Flexible conduits shall be heat-resistant lead coated steel, water-leak, fire and rust proof, and be of PLICA make or equivalent.

3.33 MOTOR CONTROL CENTRE

3.33.1 The 415 Volt motor control centres (if provided separately) shall conform to the requirements for boxes/cabinets/kiosks. They shall be fixed type, shall be fully sectionalised and shall be equipped with load break switches. Motor feeders shall be provided with isolating switch fuse unit and Contractor with thermal overload relay and single phase protection. The motor Contractor shall have one normally open auxiliary contact for alarm purposes. The motor control circuit shall be independent from all other control circuits.

3.33.2 Isolating Switches

The incoming power supply isolating switch operation handle shall be interlocked with the control cabinet door as to prevent opening of door when main switch is closed. Device for by passing the door interlock shall also be provided. Switch handle shall have provision for locking in both fully open and fully closed positions.

3.33.3 Fuses

All fuses shall be of the HRC cartridge type, conforming to IS:2208 and suitable to mount on plugin type of fuse bases. Fuses shall be provided with visible operation indicators to show that they have operated. All accessible live connections shall be adequately shrouded, and it shall be possible to change fuses with the circuit alive, without danger of contact with live conductor. Insulated fuse pulling handle shall be supplied with each control cabinet.

3.34 MOTORS

3.34.01 Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall conform to type tests and shall be subjected to routine tests as per applicable standards.

3.34.02 Enclosures

- a) For motors to be installed outdoor, the motor enclosure shall have degree of protection IP:55. For motors to be installed indoor, i.e. inside a box, the motor enclosure shall be dust proof equivalent to IP:44.
- b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.

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- c) Motors shall have drain plugs so located that they will drain water resulting condensation or other causes from all pockets in the motor casing.
- d) Motors weighing more than 25 kg shall be provided with eyebolts, lugs or other means or facility for lifting.

3.34.03 Operational Features:

- a) Continuous motor ratings (name plate rating) shall be at least suitable for the driven equipment at design duty operating point of driven equipment that will arise in service.
- b) Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously in the given system.

3.34.04 Starting Requirements

- a) All induction motors shall be suitable for full voltage direct on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops.
- b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.
- c) The locked rotor current shall not exceed six(6) times the rated full load current for all motors subject to tolerance given in IS:325.
- d) Motors when started with driven equipment imposing full starting torque and supply voltage conditions specified shall be capable of withstanding at least two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.
- e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by a least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Contractor shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speeds lower than 20% and open for speeds above 20% of the rated. The speed switch shall be capable of withstanding 120% of the rated speed in either directions of rotation.

3.34.05 The maximum permissible temperature rise over the ambient temperature shall be within the limits specified in IS:325 (for 3 phase induction motors) after adjustment due to increased ambient temperature specified.

3.34.06 The double amplitude of motor vibration shall be within the limits specified in IS:729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.

3.34.07 All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes.

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3.35 AUXILIARY SWITCH

The auxiliary switch shall conform of following type tests:

- a) Electrical endurance test - A minimum of 1000 operations for 2A. D.C. with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/ visual defects/ temperature rise test.
- b) Mechanical endurance test - A minimum of 5000 operations with a subsequent checking of contact pressure test/ visual examination
- c) Heat run test on contacts
- d) IR/HV test, etc.

3.36 LAMPS AND SOCKETS

3.36.1 Lamps: All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

3.36.2 Sockets: All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

3.36.3 Hand Lamp: A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON-OFF Switch for connection of hand lamps.

3.37 SWITCHES AND FUSES:

Each control panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with switch-fuse units. Selection of the main and sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS 9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal Protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints of the fuse rating and voltage.

All control switches shall be of rotary type. Toggle/piano switches shall not be accepted.

3.38 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS

3.38.1 Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC:137 while hollow column insulators shall be manufactured and tested in accordance with IEC 233/IS 5284. The support insulators shall be manufactured and tested as per IS: 2544 / IEC 168/IEC 273. The insulators shall also conform to IEC 815 as applicable.

Support insulators/ bushings/ hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

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- 3.38.2 Porcelain used shall be homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Hollow porcelain should be in one integral piece in green & fired stage.
- 3.38.3 Glazing of the porcelain shall be uniform brown in colour, free from blisters, burns and other similar defects.
- 3.38.4 When operating at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or when operating at normal rated voltage.
- 3.38.5 The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall be lead to deterioration. All ferrous parts shall be hot dip galvanised.
- 3.38.6 Contractor shall make available data on all the essential features of design including the method of assembly of shells and metal parts, number of shells per insulator, the manner in which mechanical stresses are transmitted through shells to adjacent parts, provision for meeting expansion stresses, results of corona and thermal shock tests, recommended working strength and any special design or arrangement employed to increase life under service conditions.
- 3.38.7 Post type insulators shall consist of a porcelain part permanently secured in metal base to be mounted on supporting structures. They shall be capable of being mounted upright. They shall be designed to withstand all shocks to which they may be subjected to during operation of the associated equipment.
- 3.38.8 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps, the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.
- 3.38.9 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued; porcelain parts by grinding and metal parts by machining. Insulator/ bushing design shall be such as to ensure a uniform compressive pressure on the joints.
- 3.38.10 Bushings, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests and acceptance test/ sample test in accordance with relevant standards.
- 3.38.11 Insulator shall also meet requirement of IEC - 815 as applicable, having alternate long & short sheds.

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3.39 CORONA AND RIV TESTS AND SEISMIC WITHSTAND TEST:

The corona (for 400kV only) and RIV tests shall confirm to the requirements as per **Annexure A** to this chapter. The seismic withstand test for shall conform to requirements as per **Annexure B** to this chapter.

3.40 ELECTRICAL NOISE CONTROL

3.40.1 The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be protected against ESD as per IEC-61000-2. Radio frequency interference. (RFI) and electro magnetic interference (EMI) protection against hardware damage and control system mal operations/errors shall be provided for all systems as per EN-50082-2(1995).

3.40.2 SURGE PROTECTION FOR SOLID STATE EQUIPMENT

All solid state systems /equipment shall be able to withstand the electrical noise and surge as encountered in actual service conditions and inherent in a power plant and shall meet the requirements of surge protection as defined in ANSI C37.90.1-1989 on its suitable equivalent class of IEC 254-4. Details of the features incorporated and relevant tests carried out. The test certificates. etc. shall be submitted by the Bidder.

3.40.3 Electronic Module/Component Details

The Contractor shall have to furnish two (2) sets of all maintenance manual of each and every electronic card/module as employed on the various systems and equipment including peripherals etc., offered by him. The Contractor will also have to furnish the data regarding the expected failure rate of various modules and other system components. Further, the Contractor shall furnish a set of operating manuals which should include block diagrams, make, model/type, details wiring and external connection drawings etc as required to do the testing and maintenance of the electronic modules.

3.41 DEVIATIONS FROM SPECIFICATIONS

Deviation, if any, from any these specifications shall be listed out separately. Bidder shall attach a separate sheet titled as "DEVIATIONS FROM SPECIFICATIONS" and list all deviations details of each deviation Section wise and Clause wise. In absence of any deviation listed out separately, adherence the specifications shall be assumed.

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3.42 INFORMATION TO BE FURNISHED BY THE CONTRACTOR/ SUB CONTRACTOR

Information/ documents to be furnished at the TENDER / CONTRACT STAGE shall be as given below: (marked 'X' in the appropriate column)

DETAILS OF DOCUMENTATION TO BE FURNISHED	At Tender Stage	At Contract Stage
Technical offer with details of equipment, scope etc	X	
Guaranteed Technical particulars	X	X
Schedule of Tests to be conducted	X	
Schedule of deviations, if any, Section wise, clause wise, with respect to technical specifications	X	
List of past supplies complete with purchase & project ref., quantity, order ref., etc. where identical equipment have been supplied.	X	-
Manufacturing Quality Plan/ Standard Check List	X	X
Field Quality Plan	X	X
GA drg with dimensions & weight and foundation/ fixing details	X	X
Drg & Data submission schedule (to be furnished at contract stage shall be specified date-wise here).	X	X
Type test Reports.	X	X
Bar chart showing the time schedule indicating the time required for design submission of drawing, manufacture of eqpt, test and inspection.	X	
Routine / Acceptance test reports.		X
Installation , Operation & Maintenance Manual	X	X
Field Quality Plan for receipt and storage, installation, testing and commissioning with details of test equipment, tests to be conducted and acceptance values	X	X

3.43 Enclosures:

1. Annexure- A - Corona And Radio Interference Voltage (RIV) Test - (3 Sheets)
2. Annexure- B - Seismic Withstand Test- (1 Sheet)
3. Annexure- C - Quality Co-Ordination Procedure -(9 Sheets)
4. Annexure- D- List Of Items requiring Quality Plan and Sub-Supplier approval (ANNEXURE-III) - (1 Sheet)
5. Annexure- E -Manufacturing Quality Plan (ANNEXURE- Q3) - (1 Sheet)
6. Annexure- F - Field Quality Plan(ANNEXURE- Q5) - (1 Sheet)
7. Annexure- G- Number of Copies and Modes of Documentation to be submitted-Part of Sec-3
8. Annexure- H- Title block to be followed for this project- (1 Sheet)
9. Annexure-I- Important meteorological data from nearest observatory at Ramagundam- (PROJECT INFORMATION: CLIMATOLOGICAL TABLE ANNEXURE-III) - (1 Sheet)
10. Annexure- J- Quality Assurance- (2 Sheets)

ANNEXURE-G

NUMBER OF COPIES AND MODES OF DOCUMENTATION TO BE SUBMITTED

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE		
			PRINTS	CD-ROMS	MANUALS
1	Drawings (for approval at Contract Stage)	2	PDF		
2	Drawings (after Revision for approval at Contract Stage)		PDF		
3	Final approved drawings for stamping (Hard copy)		4		
4	Drawings for Distribution (Stamped copy)		17		
5	Drawings "As Built "		2	6	
6	Design Calculations/Design Memorandum/Data Sheet/TTR/MQP/FQP (for Approval at Contract Stage)	1	PDF		
7	Final approved Design Calculations/Design Memorandum/Data Sheet/TTR/MQP/FQP for stamping (Hard copy)		3		
8	Design Calculations/Design Memorandum/Data Sheet/TTR/MQP/FQP for Distribution to SCCL/NTPC/BHEL Site (Stamped copy)			4	
10	Erection and Commissioning and Performance Procedure Manual			4	13
11	Operation and Maintenance Manuals			4	13
12	Inspection Test Reports (Routine and Acceptance Test Reports)			4	13

NOTE:

Quality Documentation shall be arranged in plastic folders in the same order as they appear in the QP, with cover sheet and index with QP itself as the first document at the top.

Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top.

CLAUSE NO.	TECHNICAL REQUIREMENTS		
<p data-bbox="357 524 427 551">1.00.00</p> <p data-bbox="357 815 427 842">2.00.00</p> <p data-bbox="357 958 427 985">3.00.00</p>	<p data-bbox="1209 461 1402 488" style="text-align: right;"><u>ANNEXURE - A</u></p> <p data-bbox="1289 501 1362 560" style="text-align: right;">(1/3)</p> <p data-bbox="485 524 1225 551">CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST</p> <p data-bbox="485 613 564 640">General</p> <p data-bbox="485 667 1402 788">Unless otherwise stipulated, all equipment together with its associated connectors, where applicable, shall be tested for external Corona both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV).</p> <p data-bbox="485 815 612 842">Test Levels:</p> <p data-bbox="485 873 1402 931">The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.</p> <p data-bbox="485 958 708 985">Test Methods for RIV:</p> <p data-bbox="485 1016 1402 1137">RIV tests shall be made according to measuring circuit as per International Special-committee on Radio Interference (CISPR) Publication 16-1 (1993) Part-I. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 MHz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.</p> <p data-bbox="485 1169 1402 1227">Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107-1964, except otherwise noted herein.</p> <p data-bbox="485 1258 1402 1379">In measurement of RIV temporary additional external corona shielding may be provided. In measurement of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.</p> <p data-bbox="485 1411 1402 1576">Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, 115% and 130% for the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 420kV is listed in the detailed specification together with maximum permissible RIV level in microvolts.</p> <p data-bbox="485 1608 1402 1666">The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.</p> <p data-bbox="485 1697 1402 1778">The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.</p>		
<p data-bbox="331 1854 663 1921">SINGAREMI THERMAL POWER PROJECT (2000 MW) BOILER TURBINE GENERATOR PACKAGE</p>	<p data-bbox="756 1854 979 1926">TECHNICAL SPECIFICATIONS SECTION - VI PART-B</p>	<p data-bbox="1082 1854 1225 1917">SUB-SECTION-B-16 SWITCHYARD - GENERAL</p>	<p data-bbox="1299 1854 1362 1895">PAGE 6 OF 9</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
4.00.00	<p>TEST METHODS FOR VISIBLE CORONA</p> <p>The purpose of this test is to determine the corona extinction voltage of apparatus, connectors, etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 130% of RIV test voltage and maintained there for five minutes. In case corona inception does not take place at 130%, the voltage shall be raised further till inception of corona or 420kV whichever is minimum. Thereafter the voltage will be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions at all voltage steps i.e. 85%, 100%, 115% and 130%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energized connectors. The photographs shall be framed such that test object essentially, fills the frame with no cut-off.</p> <p>For recording purpose, modern devices utilizing UV recording methods such as image intensifier may also be used.</p> <p>The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.</p> <p>In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by purchaser's Inspector, after determining the best camera locations by trial energisation of test object at a voltage, which results in corona.</p> <p>The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.</p> <p>However, both tests shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Owner's engineer if, in his opinion, it will not prejudice other test.</p>		
SINGARENI THERMAL POWER PROJECT (2000 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-16 SWITCHYARD - GENERAL	PAGE 7 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS
5.00.00	<p>TEST RECORDS:</p> <p>In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:</p> <p>Background noise before and after test.</p> <p>Detailed procedure of application of test voltage.</p> <p>Measurements of RIV levels expressed in microvolts at each level.</p> <p>Results and observations with regard to location and type of interference sources detected at each step.</p> <p>Test voltage shall be recorded when measured. RIV passes through 100 microvolts in each direction.</p> <p>Onset and extinction of visual corona for each of the four tests required shall be recorded.</p>

1/1

CLAUSE NO.	TECHNICAL REQUIREMENTS
	<p data-bbox="1204 488 1396 526" style="text-align: right;"><u>ANNEXURE – B</u></p> <p data-bbox="686 604 1197 638" style="text-align: center;">SEISMIC WITHSTAND TEST PROCEDURE</p> <p data-bbox="486 705 1396 761">The seismic withstanding test on the complete equipment (Except BPI) shall be carried out alongwith supporting structure.</p> <p data-bbox="486 795 1396 851">The Bidder shall arrange to transport the structure from his Contractor's premises/Owner's sites for the purpose of seismic withstand test only.</p> <p data-bbox="486 884 1396 996">The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the Terminal Pad of the equipment and any other point as agreed by the Owner. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the Purchaser.</p>

SINGARENI THERMAL POWER PROJECT (2300 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-15 SWITCHYARD - GENERAL	PAGE 9 OF 9
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Annexure- C - QUALITY CO-ORDINATION PROCEDURE

1. PURPOSE

- 1.1 The purpose of this document specifies the procedure to be adopted for coordination of QA & I Activities.

2. SCOPE

This document specifies procedure of:

- Quality plan and field quality plan – approval/finalization
- Inspection/Testing of equipments/items
- Disposition of Non-conformities
- Quality audit and surveillance

3. PROCEDURE

3.1 QUALITY PLANS (QP):

- 3.1.1 Vendor shall submit to NTPC, the quality plans in NTPC format placed at Annexure-E of Section-3 after ensuring compliance of technical specification requirements as a minimum and putting the signature of authorized personnel of the vendor at appropriate place on each page of the quality plans. The quality plans shall be submitted along with reference documents/plant standards/NDT Procedures/Welding specification/Heat Treatment details /Assembly & Performance test procedures as applicable as per the agreed schedule of submission of each quality plan as per MDL.
- 3.1.2 Wherever Reference Quality plan/Standard Quality Plan are available, vendor shall submit endorsement sheet as per NTPC format attached at Annexure-Q4 attached herewith.
- 3.1.3 Approval of QP in Cat-I is essential for NTPC inspection, dispatch of materials and issuance of MDCC.

3.2 FIELD QUALITY PLANS (FQP):

- 3.2.1 Vendor shall submit the FQP for equipment and services in NTPC format (placed at Annexure-F) as per agreed schedule of submission as per MDL. The FQP shall include quality practices and procedures followed by vendor/sub-vendors during various stages of site activities starting from material receipt, storage till final erection of respective equipment at site.
- 3.2.2 Wherever reference/standard Field quality plans are available, vendor shall submit endorsement sheet as per NTPC format attached at Annexure-Q4 attached herewith.

3.2.3 FQP checks shall be implemented by Vendors with the involvement of NTPC-FQA and NTPC-Erection groups as per the classification of checks agreed in the respective approved FQP.

3.3 INSPECTION:

3.3.1 The notice period for inspection of materials/ components/ equipments for witnessing of the CHP stages by SCCL/NTPC, as per approved QP requirements, at the vendor's works shall be as follows:

- a) Vendors of Indian Origin: 15 working days.
- b) Vendors of Foreign Origin: 45 working days.

3.3.2 All the matters regarding inspection call shall be coordinated as follows:

3.3.2.1 For supplies of Indian origin:

Vendor will issue the inspection calls in NTPC format (Attached at Annexure-Q6), to the concerned SCCL/NTPC inspection office. The list of various NTPC-RIO and their addresses along with their area of jurisdiction is attached at Annexure-Q7. The call shall include copy of relevant approved QP and Data-Sheet, as applicable, internal test/ inspection report, as applicable etc. Further, Vendor's representative shall be present during stage inspections along with SCCL/NTPC representative. Vendor shall closely co-ordinate with SCCL/NTPC-RIO for inspection of in house as well as bought out items.

3.3.2.2 For supplies of other than Indian Origin: Vendor shall issue Inspection call in NTPC format to concerned NTPC-QA/CTF as per the notice period mentioned under 3.3.1 above and after ensuring all documents like QAP, drawing data sheet/BBU etc as applicable are approved in Category-I.

3.3.2.3 Where witnessing of the test is waived off in writing by SCCL/NTPC, Vendor shall proceed with the witness of test, which shall be deemed to have been carried out in the presence of SCCL/NTPC inspector and Vendor shall forward duly certified copies of the inspection and test reports to the concerned NTPC-RIO.

3.3.2.4 In case of items where NTPC inspection is not involved, Vendor shall carry out the inspection as per approved quality norms and shall forward duly certified copies of the inspection and test reports to the concerned NTPC-RIO.

3.3.2.5 For the tests witnessed by SCCL/NTPC, or when the factory tests at identified CHP stages, have been satisfactorily completed including computation of test results, wherever applicable, NTPC inspector shall sign jointly with vendor/ authorized representative (as applicable per approved QP) on the CHP Clearance/ Interim Inspection report. In case of deviations or objections, NTPC inspector shall convey the same, in writing on the CHP report itself, for clarification by vendors.

- 3.3.2.6 Vendor will make available to the NTPC inspector internal documents, plant standards and procedures relevant to the checks / tests carried out on material / items / equipment. Further vendors shall also ensure the availability of approved drawings / data sheets and approved quality plan at the place of inspection.
- 3.3.3 As NTPC is approving and stamping all documents in soft copies, all documents regarding inspection shall be coordinated as follows for smooth and trouble free inspection:
- The main contractor, upon receipt of electronically approved and stamped documents (i.e. drawings/ data sheets/ BOM/ Quality Plan etc.) from NTPC shall take one print out & authenticate the document through their authorized signatories.
 - The main contractor shall then send this approved copy to the sub-supplier through e-mail or on CD along with authenticated hard copy of approved document.
 - These documents i.e. NTPC approved and stamped soft copy and main contractor's authenticated hard copy of NTPC approved document must be available at the place of inspection so that NTPC inspecting engineer can make use of these documents at the time of inspection.
 - The documents being approved by NTPC can be opened easily in "Adobe Acrobat 5.0 & above & the availability of the same shall be ensured by the main contractor/ sub-supplier.
 - If at the place of inspection internet connection is not available or signal is weak i.e. documents can not be transmitted through e-mail, NTPC approved soft copy of the document shall be available in CD form at sub-supplier's premises.

3.4 INSPECTION PLAN:

- 3.4.1 To facilitate advance planning of inspection of supplies, in addition to giving inspection notice at identified CHP stages as per approved QP, Vendor shall furnish three monthly rolling inspection program (in NTPC format) every month, indicating schedule dates of inspection at identified CHP stages, such a program shall be updated each month and a copy of the same shall be made available to NTPC-PC also. Such program shall be confirmed by specific inspection calls in accordance with clause 3.3 above.
- 3.4.2 Above three monthly inspection program for shop manufactured and BOIs shall be furnished directly to the respective NTPC-RIOs.
- 3.4.3 Vendor shall furnish monthly inspection status report for previous month including pending calls and exceptions reports / NCR, on or before 7th of every month.

3.5 NON-CONFORMITY DISPOSITIONING PROCEDURE:

- 3.5.1 Whenever any deviation is observed with respect to relevant document and good engineering practices the same shall be referred by vendor along with justifications to NTPC-RIO, where

inspection was raised by vendor in NTPC format (placed at Annexure Q8), for review and necessary action. This shall be done only after acceptance, with or without modification / corrective action. NCR can be raised irrespective of the CHP stages, to the concerned NTPC-RIO, in whose jurisdiction the item / equipment are being manufactured. NTPC decision shall be final and binding on the NCRs. Material shall be re-offered for stage inspection, as per the NCR disposal requirements specified by NTPC.

- 3.5.2 Non-conformities with respect to the site activities shall also be dealt with similar fashion except that the NCR in the specified format shall be routed through NTPC-FQA group.
- 3.5.3 Tests, as required by the approved documents (Cat-1 approved quality plan, drawing / datasheet, as applicable), NTPC-RIO / Authorized representative shall issue the MDCC, against approved BBU, as applicable.

3.6 RESPONSIBILITY FOR ISSUING MDCC

The responsibility of issuing MDCC shall be as follows:

- 3.6.1 Where inspection by SCCL/NTPC is envisaged in approved QP (inspection category Cat-I) BHEL should send inspection calls to SCCL also.
- 3.6.2 MDCC is the final document issued by SCCL/NTPC giving dispatch clearance as well as it enables the contractor to claim due payment against dispatch. In the present case, since payments are to be released by SCCL, the formal issue of MDCC as per NTPC format. NTPC can issue CHP clearance and role of NTPC shall end once CHP clearance is issued. Based on CHP clearance further activity such as Dispatch clearance/release of payment shall be by SCCL.

INDIGENOUS SUPPLIES:

The concerned Regional Inspection Office under whose jurisdiction the manufacturer is located, inspecting engineer or reviewing engineer (in case of waiver of presence of NTPC engineer) shall issue the MDCC.

FOREIGN SUPPLIES:

For items directly despatchable to site from the foreign manufacturer, the MDCC shall be issued by NTPC's inspecting engineer. In case of waiver of presence of NTPC engineer, the MDCC shall be issued by CQA engineer on satisfactory review of test reports.

For items to be brought to Vendor works from the foreign manufacturer, before final despatch to site, for assembly on other equipment, MDCC shall be issued by relevant NTPC-RIO after satisfactory activities at Vendor works and on review of CHP report of NTPC's inspecting engineer for inspection at foreign manufacturer's works or on verifying acceptance report of CQA, in case of waiver of presence of NTPC engineer for inspection at foreign source.

NOTE: Material inspection by RIO-A at the works of sub-contractor in their respective jurisdiction and dispatched to the works of the other sub-contractor for assembly or otherwise in the jurisdiction of RIO-B before final despatch to project site, shall be accorded despatch clearance on a CHP clearance report by RIO-A and the MDCC of the completed item / equipment will be issued by RIO-B as per the approved BBU.

- 3.6.3 In case, only review of Vendor's inspection report / test certificates by NTPC has been envisaged as per approved QP (inspection Category Cat-II), such reports shall be submitted to the concerned NTPC-RIO, in whose jurisdiction manufacturer is located.
- 3.6.4 In case of items where QP has not been envisaged at all (inspection category Cat-III), such material shall be cleared on the basis of Certificate of Conformity, which shall be submitted to concerned NTPC-RIO, in whose jurisdiction vendor (main contractor) is located.
4. **QUALITY AUDIT:**
- 4.1 The Vendor shall provide the necessary facilities to NTPC, for carrying out of the quality surveillance and audits as envisaged in the contract.

ENDORSEMENT SHEET FOR QP		To be filled in by NTPC	
REFERENCE / STANDARD / FIELD QUALITY PLAN (RQP / SQP/RFPQ/SFQP)		REVIEW & ENDORSEMENT BY NTPC PROJECT SPECIFIC QP NUMBER ALLOTTED	
TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		<p>REV. NO.: DATE:</p> <p>** The RQP/SQP/RFPQ/SFQP once endorsed for a particular contract shall remain valid even though the original QP may have expired or revised, unless / otherwise mutually agreed with the supplier. ☐</p> <p><i>(TICK APPLICABLE)</i></p> <p>The QP is endorsed for this project without any change</p> <p>The QP is endorsed for this project with changes as indicated.</p> <p><u>DISTRIBUTION OF ENDORSEMENT OF</u></p> <p>A) RQP/SQP:</p> <ol style="list-style-type: none"> 1. MAIN SUPPLIER (WITH A COPY OF QP) 2. MANUFACTURER 3. RJO 4. CQA-SPL 5. CQA-O/C <p>B) RFPQ/SFQP:</p> <ol style="list-style-type: none"> 1. MAIN SUPPLIER (with a copy of QP) 2. MANUFACTURER 3. NTPC FDA (with a copy of QP) 4. NTPC Erection (with a copy of QP) 5. CQA-SPL 6. CQA-O/C 	
PROJECT NAME			
CONTRACT NO			
CONTRACT NAME			
MAIN SUPPLIER			
MANUFACTURER WORKS & ADDRESS	M/S		
ITEM /EQUIPMENT / SYSTEM/			
SUB-SYSTEM DETAILS i.e. MODEL TYPE /			
SIZE /RATING etc.			
APPROVED QP NO.: RQP/SQP/RFPQ/SFQP	0000-999-QV REV. NO.: DATED**:		
<p><i>Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)</i></p> <p>I. That the item/ component is identical to that considered for QP approval. OR</p> <p>II. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same do not affect the contents of QP. OR</p> <p>III. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same affect the QP slightly, as indicated below / in attached sheet.</p>			
SIGN.: (Main Supplier)	DATE	SIGN.: (Manufacturer)	DATE:


NTPC (Reviewed /Approved by/ Date & Seal)

Sup Of Supplier/ Member in panel	FROM: SUPPLIER : (ON WHOM NTPC PLACED LOI / ORDER) M/S: Address: Contact Person: Ph:(O): Fax: Mobile: e-mail:	INSPECTION CALL FOR NTPC INSPECTION (FOR SUBMISSION BY SUPPLIER/ SUB-SUPPLIER)	TO: REGIONAL INSPECTION OFFICE NTPC LTD. Contact Person: Ph:(O): Fax: Mobile: e-mail:
PROJECT NAME: PACKAGE NAME: NTPC CONTRACT NO/ PO NO: PROPOSED DATE OF INSPECTION: ND. OF DAYS REQUIRED: WEEKLY OFF DAY (OF MANUFACTURER):	SUB-SUPPLIER (if Applicable) M/S: Address: Contact Person: Ph:(O): Fax: Mobile: e-mail: MANUFACTURER (Place of Inspection) M/S: Address: Contact Person: Ph:(O): Fax: Mobile: Ph/(R): e-mail:	REFERENCE DOCUMENT QP No. _____ Dwg/Data sheet No. _____	REMARKS/ UNDER TAKING 1. Material laterally inspected, in line with NTPC QP and found satisfactory. 2. All Reference Documents including latest revisions of NTPC approved QP / Drawing / BBU in original are available and shall be made available during inspection. 3. All stage inspection requirements if applicable have been cleared and relevant ClIP's are available. 4. (Applicable for bought out items) Inspection by Main supplier is completed and material is cleared OR Joint inspection along with Main supplier proposed 5. Type test Approval from NTPC Engr. Obtained / Pending / Not available 6. Material shall not be Despatched without Dispatch Clearance from NTPC SIGNATURE & DATE: _____ NAME & DESIGNATION: _____ ORGANIZATION: _____
SL NO BBU NO.	ITEM DESCRIPTION / TEST'S	QUANTITY Already supplied Offered Unit Insp. Ckt (*)	Insp. Cat (*) 0 - For Stage Inspection. 1 - For Final Physical Inspection. 2 - For Review of MTC's based on QIP 3 - For Nut-QP cases based on COC.

Annexure-Q7

NTPC REGIONAL INSPECTION OFFICES

SL.NO	R/O LOCATION	AREAS COVERED	HOD AND OTHER EXECUTIVES	PHONE NOS
1	CQA	BOUGHT OUT ITEMS(BOI) FROM FOREIGN SOURCES	more info	0120-2410219 0120-2410207 0120-2410299 0120-2410430 0120-2410231 0120-2410208 (FAX)
2	DELHI	DELHI HARYANA(EXCPT YAMUNANAGAR) RAJASTHAN PUNJAB JAMMU AND KASHMIR UP(EXCPT JHANSI,MUZAFFARNAGAR) UTTARANCHAL(RUDRAPUR ONLY) MP(GWALIOR ONLY)	S.K.BHOWMICK, AGM(IS) RAHUL SRIVASTAVA, DGM(IS) ENGINEERING OFFICE COMPLEX A&A SECTOR 24 NOIDA 201 301 more info	7410788 2410136(FAX)
3	BANGALORE	KARNATAKA(EXCPT GULBARGA) TAMILNADU(HOSUR ONLY)	A.D. Srivastava AGM(IS) -29A, 100FT ROAD B M SHRI CIRCLE DINDRA NAGAR FIRST STAGE BANGALORE-560 036 more info	080-25205908 080-25205901 080-25205906 (FAX)
4	BHOPAL	MP(EXCPT GWALIOR) CHHATTISGARH MAHARASHTRA(NAGPUR AND CHANDRAPUR ONLY) UP(JHANSI ONLY)	M MISHRA AGM(IS) GROUND FLOOR, BLOCK -II, CENTRAL ANNEXE BHEL COMPLEX BHOPAL 4620 821 more info	0755-2500094 0755-2500138 0755-2500306 (FAX)
5	MUMBAI	MAHARASHTRA(EXCPT NAGPUR) GUJARAT GOA DADRA AND DAMAN DIUVASA	BIRENDERA KUMAR AGM (IS) SAMRUDDHI VENTURE PARK 2ND FLOOR,MIDC MAROL, ANDHERI EAST,MUMBAI 400 091 more info	022-28206395 022-25702345 022-28210218 (FAX)
6	KOLKATA	WEST BENGAL NE STATES ORISSA BIHAR JHARKHAND	G J P NARAYANAN GM(IS) 7B-PRETORIA STREET,KOLKATA 700 071 more info	033-22824051 033-24431880 033- 22826263,22828594 (FAX)
7	HARDWAR	UP (HARDWAR,ROORKEE,SAHARANPUR,MUZAFFARNAGAR ONLY) UTTARANCHAL(EXCPT RUDRAPUR) HARYANA(YAMUNANAGAR ONLY)	M CHANDRASEKARAN AGM(IS) ADMINISTRATIVE BUILDING NO 3,BHEL RANIPUR HARDWAR 249 401 more info	01334-227964 01334-231362 01334-225893 (FAX)
8	HYDERABAD	AP(EXCPT CHITTUR AND NELLORE)(by no chennai) KARNATAKA(Gulbarga only)	RAJ SHEKHAR AGM(IS) 79 BUILDING, BHEL RAMACHANDRAPURAM, HYDERABAD, 500 052 more info	040-23020954 040-23058190 040-23020872 (FAX)
9	CHENNAI	TAMILNADU(EXCEPT SOUTHERN TAMILNADU and coimbatore)(by no THIRUVANANTHAPURAM) RANIPET,ERODE AND SALEM(BY no ranipet),HOSUR,(by no bangalore) PONDICHERRY	M CHANDRASHEKARAN AGM(IS) ALEXANDER SQUARE NEW NO 2 SANDAR PATEL RD GUNDBY,CHENNAI 600 032 more info	044-22355526 044-22434932 044-22355525 (FAX)
10	RANIPET	TAMILNADU(RANIPET,ERODE AND SALEM ONLY)	T RAJGANATHAN DGM(ES) ADDRESS-C/O BHEL, VELLICORE DISTRICT, RANIPET 632406 more info	04172-241510 04172-254814 04172-242310 (FAX)
11	TRICHIRAPALLI	TAMILNADU(TRICHY AND SOUTHERN TAMILNADU ONLY)	A. SIVANANTHAN DGM(BC) C/O BHEL, H/OP 2,4 BUILDINGS KAILASHPURAM, TRICHY 620 014 more info	0431-2520031 0431-2551514 0431-2530009 (FAX)
12	THIRUVANTHAPURAM	KERALA, TAMILNADU(COIMBATORE ONLY)	FRASAD more info	0471-2541933
SL.NO	R/O LOCATION	AREAS COVERED	HOD AND OTHER EXECUTIVES	PHONE NOS

	NON- CONFORMITY REPORT FOR MANUFACTURING & INSPECTION STAGES	FOR NTPC USE ONLY	
		NC NO.:	
		DATE:	
		PAGE: 1 OF 3	
CONTRACT NAME & NO : _____ PACKAGE UNIT NO. : _____ CONTRACTOR : _____ SUB-CONTRACTOR : _____ PLACE OF MANUFACTURE : _____		CATEGORY OF NON- CONFORMITY Annexure-QB A <input type="checkbox"/> REFER NOTE-2 B <input type="checkbox"/>	
DETAILS			
ITEM DESCRIPTION: _____		IDENTIFICATION NO. _____	
RANGE/SIZE/TYPE : _____		QUALITY PLAN NO: _____ CHP NO: & CLAUSE NO.	
STAGE OF NON-CONFORMITY <input type="checkbox"/> DESIGN (A) / RAW MATERIAL (B) / ASSEMBLY(C) / IN PROCESS(D)-(SPECIFY) _____ STORAGE(E) / HANDLING(F) / TESTING(G) / ANY OTHER(H)-(SPECIFY) _____			
NON-CONFORMITY-DESCRIPTION WITH CAUSE (Attach Relevant Drgs/Details) 			
PROPOSED DISPOSITION WITH JUSTIFICATION - (FOR CORRECTION) (Note: Attach Details including design calculation)		DISPOSITIONING CODE <input type="checkbox"/> REFER NOTE-6	
STEPS TO PREVENT RECURRANCE-(FOR CORRECTIVE ACTION) 			
NAME & DESIGN ENCL: 1. 2.		SIG. OF CONTRACTOR 	
		DATE ____ (SEAL)	
FINAL DISPOSITIONING BY INSPECTION INCHARGE OF RIO		DISPOSITIONING CODE <input type="checkbox"/> REFER NOTE-6	
DATE:		SIGNATURE:	
NAME & DESIG.			

Annexure - F

Annexure-05

SUPPLIER'S LOGO		SUPPLIER'S NAME AND ADDRESS		FIELD QUALITY PLAN						PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:	
SL NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK #	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.		

MANUFACTURER/ SUB-SUPPLIER		SIGNATURE		DOC. NO.:		REV.	
<p>LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. LEGEND TO BE USED: CLASS # 1: A = CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, 'B' SHALL BE WITNESSED BY NTPC EXECUTION / CONSTRUCTION DEPTT. AND 'C' SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE NTPC CRP STAGE)</p>				FOR NTPC USE		APPROVED BY	
<p>FORMAT NO.: QS-01-QA-I-P-09/F2-R1</p>				REVIEWED BY		APPROVAL SEAL	
						ENGG. DIV./QA&I	

ANNEXURE - H

NTPC DRAWING NO.

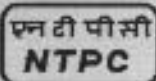
OWNER :



THE SINGARENI COLLIERIES COMPANY LTD.

(A Government company)
POWER PROJECT DIVISION

CONSULTANT :



एन टी पी सी लिमिटेड
NTPC Limited
(A Government of India Enterprise)
CONSULTING WING

PROJECT :

SCCL COAL BASED THERMAL POWER PLANT
(2 X 600MW)

PACKAGE

BOILER TURBINE GENERATOR PACKAGE

CONTRACTOR



BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT
CODE

NAME

SIGN

DATE

DRN			
CHD			
APPD			

TITLE

LEGEND

						DEPT.	SCALE	DRAWING NO.	
						SIGN			
						DATE		SHEET 1	OF 1
								REV.	00

CLAUSE NO.	PROJECT INFORMATION
------------	---------------------

CLIMATOLOGICAL TABLE

Annexure-I
ANNEXURE-III

(PAGE 1 OF 1)

CLIMATOLOGICAL TABLE

MONTHLY MEAN TEMPERATURE, RELATIVE HUMIDITY, WIND VELOCITY, SUNSHINE, RAINFALL, AND OTHER CLIMATIC DATA FOR THE YEAR 1983

MONTH	MONTHLY MEAN TEMPERATURE (°C)												RELATIVE HUMIDITY (%)	WIND VELOCITY (km/hr)	SUNSHINE (hrs)	RAINFALL (mm)	NO. OF RAINY DAYS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
1983	26.2	26.8	27.5	28.2	29.0	29.8	30.5	31.2	31.8	32.5	33.2	33.8	34.5	35.2	35.8	36.5	37.2	37.8	38.5	39.2	39.8	40.5	41.2	41.8	42.5	43.2	43.8	44.5	45.2	45.8	46.5	47.2	47.8	48.5	49.2	49.8	50.5	51.2	51.8	52.5	53.2	53.8	54.5	55.2	55.8	56.5	57.2	57.8	58.5	59.2	59.8	60.5	61.2	61.8	62.5	63.2	63.8	64.5	65.2	65.8	66.5	67.2	67.8	68.5	69.2	69.8	70.5	71.2	71.8	72.5	73.2	73.8	74.5	75.2	75.8	76.5	77.2	77.8	78.5	79.2	79.8	80.5	81.2	81.8	82.5	83.2	83.8	84.5	85.2	85.8	86.5	87.2	87.8	88.5	89.2	89.8	90.5	91.2	91.8	92.5	93.2	93.8	94.5	95.2	95.8	96.5	97.2	97.8	98.5	99.2	99.8	100.5	101.2	101.8	102.5	103.2	103.8	104.5	105.2	105.8	106.5	107.2	107.8	108.5	109.2	109.8	110.5	111.2	111.8	112.5	113.2	113.8	114.5	115.2	115.8	116.5	117.2	117.8	118.5	119.2	119.8	120.5	121.2	121.8	122.5	123.2	123.8	124.5	125.2	125.8	126.5	127.2	127.8	128.5	129.2	129.8	130.5	131.2	131.8	132.5	133.2	133.8	134.5	135.2	135.8	136.5	137.2	137.8	138.5	139.2	139.8	140.5	141.2	141.8	142.5	143.2	143.8	144.5	145.2	145.8	146.5	147.2	147.8	148.5	149.2	149.8	150.5	151.2	151.8	152.5	153.2	153.8	154.5	155.2	155.8	156.5	157.2	157.8	158.5	159.2	159.8	160.5	161.2	161.8	162.5	163.2	163.8	164.5	165.2	165.8	166.5	167.2	167.8	168.5	169.2	169.8	170.5	171.2	171.8	172.5	173.2	173.8	174.5	175.2	175.8	176.5	177.2	177.8	178.5	179.2	179.8	180.5	181.2	181.8	182.5	183.2	183.8	184.5	185.2	185.8	186.5	187.2	187.8	188.5	189.2	189.8	190.5	191.2	191.8	192.5	193.2	193.8	194.5	195.2	195.8	196.5	197.2	197.8	198.5	199.2	199.8	200.5	201.2	201.8	202.5	203.2	203.8	204.5	205.2	205.8	206.5	207.2	207.8	208.5	209.2	209.8	210.5	211.2	211.8	212.5	213.2	213.8	214.5	215.2	215.8	216.5	217.2	217.8	218.5	219.2	219.8	220.5	221.2	221.8	222.5	223.2	223.8	224.5	225.2	225.8	226.5	227.2	227.8	228.5	229.2	229.8	230.5	231.2	231.8	232.5	233.2	233.8	234.5	235.2	235.8	236.5	237.2	237.8	238.5	239.2	239.8	240.5	241.2	241.8	242.5	243.2	243.8	244.5	245.2	245.8	246.5	247.2	247.8	248.5	249.2	249.8	250.5	251.2	251.8	252.5	253.2	253.8	254.5	255.2	255.8	256.5	257.2	257.8	258.5	259.2	259.8	260.5	261.2	261.8	262.5	263.2	263.8	264.5	265.2	265.8	266.5	267.2	267.8	268.5	269.2	269.8	270.5	271.2	271.8	272.5	273.2	273.8	274.5	275.2	275.8	276.5	277.2	277.8	278.5	279.2	279.8	280.5	281.2	281.8	282.5	283.2	283.8	284.5	285.2	285.8	286.5	287.2	287.8	288.5	289.2	289.8	290.5	291.2	291.8	292.5	293.2	293.8	294.5	295.2	295.8	296.5	297.2	297.8	298.5	299.2	299.8	300.5	301.2	301.8	302.5	303.2	303.8	304.5	305.2	305.8	306.5	307.2	307.8	308.5	309.2	309.8	310.5	311.2	311.8	312.5	313.2	313.8	314.5	315.2	315.8	316.5	317.2	317.8	318.5	319.2	319.8	320.5	321.2	321.8	322.5	323.2	323.8	324.5	325.2	325.8	326.5	327.2	327.8	328.5	329.2	329.8	330.5	331.2	331.8	332.5	333.2	333.8	334.5	335.2	335.8	336.5	337.2	337.8	338.5	339.2	339.8	340.5	341.2	341.8	342.5	343.2	343.8	344.5	345.2	345.8	346.5	347.2	347.8	348.5	349.2	349.8	350.5	351.2	351.8	352.5	353.2	353.8	354.5	355.2	355.8	356.5	357.2	357.8	358.5	359.2	359.8	360.5	361.2	361.8	362.5	363.2	363.8	364.5	365.2	365.8	366.5	367.2	367.8	368.5	369.2	369.8	370.5	371.2	371.8	372.5	373.2	373.8	374.5	375.2	375.8	376.5	377.2	377.8	378.5	379.2	379.8	380.5	381.2	381.8	382.5	383.2	383.8	384.5	385.2	385.8	386.5	387.2	387.8	388.5	389.2	389.8	390.5	391.2	391.8	392.5	393.2	393.8	394.5	395.2	395.8	396.5	397.2	397.8	398.5	399.2	399.8	400.5	401.2	401.8	402.5	403.2	403.8	404.5	405.2	405.8	406.5	407.2	407.8	408.5	409.2	409.8	410.5	411.2	411.8	412.5	413.2	413.8	414.5	415.2	415.8	416.5	417.2	417.8	418.5	419.2	419.8	420.5	421.2	421.8	422.5	423.2	423.8	424.5	425.2	425.8	426.5	427.2	427.8	428.5	429.2	429.8	430.5	431.2	431.8	432.5	433.2	433.8	434.5	435.2	435.8	436.5	437.2	437.8	438.5	439.2	439.8	440.5	441.2	441.8	442.5	443.2	443.8	444.5	445.2	445.8	446.5	447.2	447.8	448.5	449.2	449.8	450.5	451.2	451.8	452.5	453.2	453.8	454.5	455.2	455.8	456.5	457.2	457.8	458.5	459.2	459.8	460.5	461.2	461.8	462.5	463.2	463.8	464.5	465.2	465.8	466.5	467.2	467.8	468.5	469.2	469.8	470.5	471.2	471.8	472.5	473.2	473.8	474.5	475.2	475.8	476.5	477.2	477.8	478.5	479.2	479.8	480.5	481.2	481.8	482.5	483.2	483.8	484.5	485.2	485.8	486.5	487.2	487.8	488.5	489.2	489.8	490.5	491.2	491.8	492.5	493.2	493.8	494.5	495.2	495.8	496.5	497.2	497.8	498.5	499.2	499.8	500.5	501.2	501.8	502.5	503.2	503.8	504.5	505.2	505.8	506.5	507.2	507.8	508.5	509.2	509.8	510.5	511.2	511.8	512.5	513.2	513.8	514.5	515.2	515.8	516.5	517.2	517.8	518.5	519.2	519.8	520.5	521.2	521.8	522.5	523.2	523.8	524.5	525.2	525.8	526.5	527.2	527.8	528.5	529.2	529.8	530.5	531.2	531.8	532.5	533.2	533.8	534.5	535.2	535.8	536.5	537.2	537.8	538.5	539.2	539.8	540.5	541.2	541.8	542.5	543.2	543.8	544.5	545.2	545.8	546.5	547.2	547.8	548.5	549.2	549.8	550.5	551.2	551.8	552.5	553.2	553.8	554.5	555.2	555.8	556.5	557.2	557.8	558.5	559.2	559.8	560.5	561.2	561.8	562.5	563.2	563.8	564.5	565.2	565.8	566.5	567.2	567.8	568.5	569.2	569.8	570.5	571.2	571.8	572.5	573.2	573.8	574.5	575.2	575.8	576.5	577.2	577.8	578.5	579.2	579.8	580.5	581.2	581.8	582.5	583.2	583.8	584.5	585.2	585.8	586.5	587.2	587.8	588.5	589.2	589.8	590.5	591.2	591.8	592.5	593.2	593.8	594.5	595.2	595.8	596.5	597.2	597.8	598.5	599.2	599.8	600.5	601.2	601.8	602.5	603.2	603.8	604.5	605.2	605.8	606.5	607.2	607.8	608.5	609.2	609.8	610.5	611.2	611.8	612.5	613.2	613.8	614.5	615.2	615.8	616.5	617.2	617.8	618.5	619.2	619.8	620.5	621.2	621.8	622.5	623.2	623.8	624.5	625.2	625.8	626.5	627.2	627.8	628.5	629.2	629.8	630.5	631.2	631.8	632.5	633.2	633.8	634.5	635.2	635.8	636.5	637.2	637.8	638.5	639.2	639.8	640.5	641.2	641.8	642.5	643.2	643.8	644.5	645.2	645.8	646.5	647.2	647.8	648.5	649.2	649.8	650.5	651.2	651.8	652.5	653.2	653.8	654.5	655.2	655.8	656.5	657.2	657.8	658.5	659.2	659.8	660.5	661.2	661.8	662.5	663.2	663.8	664.5	665.2	665.8	666.5	667.2	667.8	668.5	669.2	669.8	670.5	671.2	671.8	672.5	673.2	673.8	674.5	675.2	675.8	676.5	677.2	677.8	678.5	679.2	679.8	680.5	681.2	681.8	682.5	683.2	683.8	684.5	685.2	685.8	686.5	687.2	687.8	688.5	689.2	689.8	690.5	691.2	691.8	692.5	693.2	693.8	694.5	695.2	695.8	696.5	697.2	697.8	698.5	699.2	699.8	700.5	701.2	701.8	702.5	703.2	703.8	704.5	705.2	705.8	706.5	707.2	707.8	708.5	709.2	709.8	710.5	711.2	711.8	712.5	713.2	713.8	714.5	715.2	715.8	716.5	717.2	717.8	718.5	719.2	719.8	720.5	721.2	721.8	722.5	723.2	723.8	724.5	725.2	725.8	726.5	727.2	727.8	728.5	729.2	729.8	730.5	731.2	731.8	732.5	733.2	733.8	734.5	735.2	735.8	736.5	737.2	737.8	738.5	739.2	739.8	740.5	741.2	741.8	742.5	743.2	743.8	744.5	745.2	745.8	746.5	747.2	747.8	748.5	749.2	749.8	750.5	751.2	751.8	752.5	753.2	753.8	754.5	755.2	755.8	756.5	757.2	757.8	758.5	759.2	759.8	760.5	761.2	761.8	762.5	763.2	763.8	764.5	765.2	765.8	766.5	767.2	767.8	768.5	769.2	769.8	770.5	771.2	771.8	772.5	773.2	773.8	774.5	775.2	775.8	776.5	777.2	777.8	778.5	779.2	779.8	780.5	781.2	781.8	782.5	783.2	783.8	784.5	785.2	785.8	786.5	787.2	787.8	788.5	789.2	789.8	790.5	791.2	791.8	792.5	793.2	793.8	794.5	795.2	795.8	796.5	797.2	797.8	798.5	799.2	799.8	800.5	801.2	801.8	802.5	803.2	803.8	804.5	805.2	805.8	806.5	807.2	807.8	808.5	809.2	809.8	810.5	811.2	811.8	812.5	813.2	813.8	814.5	815.2	815.8	816.5	817.2	817.8	818.5	819.2	819.8	820.5

CLAUSE NO.		QUALITY ASSURANCE		
SWITCHYARD		SQE 20		
Attributes / Characteristics	Items/Components Sub Systems	Make, model, Type & Rating, Test Certificate	Routine & Acceptance Test as per IS / IEC	Functional requirements as per SCCL Specification
	Circuit Breaker (IEC:62271-100)	Y	Y	Y
	Interruptor & hollow insulator (IEC:233/ IS:5284)	Y	Y	Y
	Isolator (IEC:62271-102)	Y	Y	Y
	Current Transformer (IEC:60044/BS:3938/IS2705)	Y	Y	Y
	Capacitor Voltage Transformer (IEC:186A / 358/IS3156/IEC60044)	Y	Y	Y
	Bus Post Insulator (IEC:168 / 815 / IS:2544)	Y	Y	Y
	Disc, Pin & String Insulator (IEC:383 / IS:731)	Y	Y	Y
	Long Rod Insulator (IEC:433)	Y	Y	Y
	Surge Arrestor (IEC:99-4/IS:3070)	Y	Y	Y
	Hardware fittings for Insulator (IS:2486 / BS:3288)	Y	Y	Y
	Spacer Clamps & Connector (IS:10162 / 5561)	Y	Y	Y
	Aluminium Tube (IS:5082 / 2673 / 2678)	Y	Y	Y
	Wave Trap (IEC:353 / IS:8792 / 8793)	Y	Y	Y
	Conductor (IS:398-P-II)(V)	Y	Y	Y
	Galvanised Steel Structures (IS:2062/2629/4759/6745)	Y	Y	Y
	Vibration Damper (IS:9708)	Y	Y	Y
	Sag Compensating Spring DIN:2089/2096 IS:3195 / 7906	Y	Y	Y
	Control & Relay Panel	Y	Y	Y
	SF6 Gas filling & evacuating plant	Y	Y	Y
	SF6 Gas Leak Detector	Y	Y	Y
	Leakage Current Analyser	Y	Y	Y
	Nitrogen Gas Filling Device	Y	Y	Y
	Protection Relays	Y	Y	Y
	Event Logger	Y	Y	Y
	Operation Analyser	Y	Y	Y
	Disturbance Recorder	Y	Y	Y
	Tariff Metering System	Y	Y	Y
	Synchronising Trolley	Y	Y	Y

SINGAREN THERMAL POWER PROJECT (2X630 MW) ROILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION VI PART-B	SUB-SECTION-E-H SWITCHYARD	PAGE 1 OF 2
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CLAUSE NO.	QUALITY ASSURANCE		
Attributes / Characteristics Items/Components Sub Systems	Make, Type Rating, and Model, Test Certificates	Routine & Acceptance Test as per relevant IS/IEC	Functional requirements as per SCCL Specification
	Relay Test Kit	Y	Y	Y
LT Switchgear /LT Panels (IEC:947 / IS:13947)	Y	Y	Y
Battery IS:1652	Y	Y	Y
Lighting Panels	Y	Y	Y
Surge Monitor	Y	Y	Y
<p>Notes : 1) This is an indicative list of test/checks. The manufacture is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents during QP finalisation for all items.</p> <p>2) All major Bought Out Items will be subject to SCCL approval.</p>			
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION VI PART-IV	SUB-SECTION-E-1C SWITCHYARD	PAGE 2 OF 2

PROJECT: 400 KV AND 132 KV SWITCHYARD FOR SINGARENI THERMAL POWER PROJECT
2X660MW AT ADILABAD, AP

Bharat Heavy Electricals Ltd.
Doc. No. TB-353-316-001
Rev. No. 00
Page No.: 4- 1

Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

SECTION 4

GUARANTEED AND TECHNICAL PARTICULARS

As per SCCL (2X600MW) BTG package, Technical Specification enclosed as below:

Section-VI, Part-G, Technical Data Sheet – EHV CIRCUIT BREAKERS (DB17), Page 131 to 136.

SUB-SECTION - DB17

EHV CIRCUIT BREAKER

SINGARENI THERMAL POWER PROJECT
(2X600 MW)
BOILER TURBINE GENERATOR PACKAGE

TECHNICAL DATA SHEET
SECTION-VI
PART - G

CLAUSE NO.	Bidder's Name				
1.	<p style="text-align: center;">E 1</p> <p style="text-align: center;">EHV CIRCUIT BREAKERS</p> <p>(Bidder to fill up following data for each type and rating of the equipment alongwith the bid)</p> <p>General</p> <p>a) Name & country of the Manufacturer</p> <p>b) Type of Circuit breaker</p> <p>c) Manufacturer's type designation</p> <p>d) Standards Applicable</p> <p>e) Rated Voltage (KV)</p> <p>f) Rated Current</p> <p> i) Under normal condition (Amps)</p> <p> ii) Under site conditions (Amps)</p> <p>g) Rated frequency (Hz)</p> <p>h) Number of poles</p> <p>i) Whether 3 poles or single pole unit</p> <p>j) Whether dead tank or live tank design</p> <p>k) No. of breaks per pole</p> <p>Guaranteed Ratings</p> <p>a) Rated short circuit breaking current</p> <p> i) Symmetrical component at highest system voltage (kA)</p>				
	I	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="320 1937 751 2033" style="text-align: center;"> SINGAREN I THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE </td> <td data-bbox="751 1937 1066 2033" style="text-align: center;"> TECHNICAL DATA SHEET SECTION-VI PART-G </td> <td data-bbox="1066 1937 1289 2033" style="text-align: center;"> DB17: EHV CIRCUIT BREAKER </td> <td data-bbox="1289 1937 1420 2033" style="text-align: center;"> PAGE 1 OF 5 </td> </tr> </table>	SINGAREN I THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEET SECTION-VI PART-G	DB17: EHV CIRCUIT BREAKER
SINGAREN I THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEET SECTION-VI PART-G	DB17: EHV CIRCUIT BREAKER	PAGE 1 OF 5		

CLAUSE NO.	Bidder's Name		
	<ul style="list-style-type: none"> <li data-bbox="411 421 1380 454">ii) DC Component (%) <li data-bbox="411 465 1380 555">iii) Asymmetrical breaking current at highest system voltage (kA) <li data-bbox="323 595 1380 622">b) Rated Making capacity <li data-bbox="411 663 1380 719">i) at higher rated voltage (kA peak) <li data-bbox="411 759 1380 815">ii) at lower rated voltage (kA peak) <li data-bbox="323 855 1380 945">c) Maximum break time for any current upto rated breaking current (ms) <li data-bbox="411 983 1380 1039">i) For Test duties 2,3 & 4 at rated values <li data-bbox="411 1079 1380 1169">ii) For other duties at limiting conditions of voltage and pressure <li data-bbox="323 1207 1380 1234">d) Closing times (ms) <li data-bbox="323 1274 1380 1397">e) Minimum opening time under any condition with limiting voltage and pressure (ms) <li data-bbox="323 1438 1380 1527">f) Maximum opening time under any condition with limiting voltage and pressure (ms) <li data-bbox="323 1565 1380 1592">g) First pole to clear factor <li data-bbox="323 1632 1380 1659">h) Short time current rating (kA) <li data-bbox="411 1700 1380 1727">i) 1 Second <li data-bbox="411 1767 1380 1794">ii) 3 Second <li data-bbox="323 1834 1380 1861">i) Rated operating duty 		
<p style="text-align: center;">SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILERTURBINE GENERATOR PACKAGE</p>	<p style="text-align: center;">TECHNICAL DATA SHEET SECTION-VI PART-G</p>	<p style="text-align: center;">DB17: EHV CIRCUIT BREAKER</p>	<p style="text-align: center;">PAGE 2 OF 5</p>

CLAUSE NO.	Bidder's Name		
	j) Maximum line charging breaking current with temporary over voltage up to 1.4 p.u. (kA)	.....	.....
	k) Maximum arc duration and corresponding current under lockout pressure.	.....	.....
	l) Pre-insertion resistor (if applicable)	.....	.....
	i) Value / pole (Ohms)/with tolerance	.....	.....
	ii) Minimum and maximum duration of insertion per pole (ms)	.....	.....
	iii) Thermal rating for the C-1m-0-CO-2m-C-1m-O-CO for terminal fault considering maximum resistance and time setting	.....	.....
	iv) Thermal rating for the same duty as (iii) above for reclosing against trapped charges	.....	.....
	3. Dielectric with-stand of Complete	.....	.....
	Breaker	.....	.....
	a) One minute dry & wet power frequency withstand voltage	.....	.....
	i) Between live terminal and ground (kV rms)	.....	.....
	ii) Between terminals with breaker contacts open (kV rms)	.....	.....
SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILERTURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEET SECTION-VI PART-G	DB17: EHV CIRCUIT BREAKER	PAGE 3 OF 5

CLAUSE NO.	Bidder's Name		
	<p>b) 1.2/50 micro second impulse withstand test voltage</p> <p>i) Between live terminal and ground (kV peak)</p> <p>ii) Between terminals with breaker contacts open (kV peak)</p> <p>c) 250/2500 micro second impulse switching surge withstand test voltage</p> <p>i) Between live terminal and ground (kV peak)</p> <p>ii) Between terminals with breaker contacts open (kV peak)</p> <p>d) Total creepage distance</p> <p>i) To ground (mm)</p> <p>ii) Between terminals (mm)</p> <p>4. Operating Mechanism</p> <p>a) Type of operating mechanism for</p> <p>i) Closing</p> <p>ii) Opening</p> <p>5. Quenching Media</p> <p>a) Quantity of SF6 per pole at rated pressure (Kg)</p> <p>b) Guaranteed maximum leakage rate per year</p>		
<p>SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEET SECTION-VI PART-G</p>	<p>DB17: EHV CIRCUIT BREAKER</p>	<p>PAGE 4 OF 5</p>

CLAUSE NO.	Bidder's Name				
6.	c) Rated pressure of SF6 in operating chamber (Kg/cm ²) d) Limit of pressure at which breaker operates correctly (Kg/cm ²)				
	Constructional Details a) Type and capacity of device used to obtain uniform voltage distribution between breaks b) Number of auxiliary contacts per pole provided i) NO ii) NC iii) Adjustable				
7.	Detailed Literature (Whether the following are enclosed) a) Type test reports Yes/No b) OGA drawing of breaker Yes/No				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%; text-align: center; padding: 5px;"> SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILERTURBINE GENERATOR PACKAGE </td> <td style="width: 20%; text-align: center; padding: 5px;"> TECHNICAL DATA SHEET SECTION-VI PART-G </td> <td style="width: 15%; text-align: center; padding: 5px;"> DB17: EHV CIRCUIT BREAKER </td> <td style="width: 20%; text-align: center; padding: 5px;"> PAGE 5 OF 5 </td> </tr> </table>		SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILERTURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEET SECTION-VI PART-G	DB17: EHV CIRCUIT BREAKER	PAGE 5 OF 5
SINGARENITHERMAL POWER PROJECT (2X600 MW) BOILERTURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEET SECTION-VI PART-G	DB17: EHV CIRCUIT BREAKER	PAGE 5 OF 5		

PROJECT: 400 KV AND 132 KV SWITCHYARD FOR SINGARENI THERMAL POWER PROJECT
2X660MW AT ADILABAD, AP

Bharat Heavy Electricals Ltd.
Doc. No. TB-353-316-010
Rev. No. 00
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Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

SECTION 5

ENCLOSURES TO SPECIFICATIONS

ANNEXURE 1 NO DEVIATION CERTIFICATE

ANNEXURE 2 CHECK LIST OF INFORMATION TO BE FURNISHED
WITH THE OFFER

ANNEXURE 3 PROVENNESS CRITERIA FOR CIRCUIT BREAKERS:
ATTACHMENT-3A28 (PAGE 1 AND 2 OF 8)

(TO BE FILLED AT TENDER STAGE)

PROJECT: 400 KV AND 132 KV SWITCHYARD FOR SINGARENI THERMAL POWER PROJECT
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Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

ANNEXURE-1

It is confirmed that there are no deviations and the offer is in full compliance with the specification. It is also confirmed that there are no deviations in any other form such as comments, variations and/ or exceptions. Further it is confirmed that at all drawings / data sheets/QP/ type tests reports shall be submitted to BHEL for organising approval of ultimate customer. Also, furnishing of all relevant information / repetition of type tests (if required for meeting the specification requirement) shall be carried out by us at no extra cost to BHEL & without affecting delivery requirements.

Signature of the authorized representative of Bidder

Name _____

Designation _____

Place _____

Date _____

Company seal

PROJECT: 400 KV AND 132 KV SWITCHYARD FOR SINGARENI THERMAL POWER PROJECT 2X660MW AT ADILABAD, AP

Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

Bharat Heavy Electricals Ltd.
Doc. No. TB-353-316-001
Rev. No. 00
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Annexure-2

CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER
BIDDER SHALL PUT A TICK '✓' IF THE INFORMATION IS ENCLOSED WITH THE OFFER, PUT A CROSS 'X' IF THE INFORMATION IS NOT ENCLOSED OR WRITE 'NOT APPLICABLE' IF THE QUERY/SCHEDULE IS NOT RELEVANT AND RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

The offer may not be considered if the following information and this Checklist are not enclosed with the offer.

BIDDER: OFFER REFERENCE:

1. Technical offer with detailed schedules of equipment/ material and spares _____
2. Guaranteed Technical Particulars _____
3. List of past supplies complete with purchase Order & Project name, quantity, order reference, etc. where identical equipment have been supplied. _____
4. Manufacturer's quality plans for approval _____
5. Field Quality plan for approval _____
6. General Arrangement drawings with dimensions and weights and foundation/fixing details _____
7. Drawing/data submissions schedule _____
8. Type test reports. The type test reports shall be accompanied with a list listing all the relevant clauses of the applicable standard and the corresponding type test report. The manufacturer shall also furnish a certificate certifying that the test reports have been carried out on equipment identical in all respects to the one offered. In case the reports are for different equipment and the applicability of the report is permitted as per applicable standards, the justification shall be enclosed to the list of type test reports. _____
9. Bar Chart showing time schedule showing time required for design, manufacture, test and inspection, transport, erection, site testing and commissioning _____
10. Makes of all important components, like motors, operating switches, fuses, etc. _____
11. Provenness Data _____
12. Any additional information called for in any part of the technical specification. _____

Date:

Signature of the authorized representative of Bidder

Company Seal

**BOILER TURBINE GENERATOR PACKAGE FOR
SINGARENI THERMAL POWER PROJECT (2X600 MW)
BID DOCUMENT NO. CW-9596-108**

Sub-Vendor's Name and Address : To
Employer's Name & Address

Sub : Sub-Qualifying Requirements for the 400 KV Circuit Breaker

Dear Sirs,

- (A) **For 400 KV Circuit Breakers** : In order to satisfy the requirement of Sub-vendor experience as indicated in Technical Specifications, Clause No. 4.6.20 of Sub-Section-IIA-01, Part-A, Section-VI of Bidding Documents, we declare that M/ s..... is a manufacturer who have manufactured and supplied minimum five (5) nos. of three phase circuit breakers suitable for Air Insulated Substation/Switchyard of 400 KV or above class which are in successful operation for a minimum period of two (2) years as on the date of bid opening. We further declare that the 400 KV circuit Breaker offered have been type tested as on date of bid opening as per IEC-62271-100. The details are given below :

S.No.	Description	Installation
For 400 KV Circuit Breakers		
1	Name and Address of Manufacturer and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address alongwith Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Substation/ Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
(i)	Manufacture	Yes*/No*
(ii)	Type Test	Yes*/No*
(iii)	Supply	Yes*/No*

S.No.	Description	Installation
7.	(i) No. of 3 Phase Circuit Breakers Supplied	
	(ii) Voltage Level (in KV)	
	(iii) Whether suitable for Air insulated Substation/ Switchyard	Yes*/No*
8.	Date of Commissioning	
9.	Date of commencement of successful operation	
10.	No. of years in Successful operation as on date of Bid opening	
11.	Client(s) certificate(s) enclosed in support of stated experience at Sr.No. 6 to 10 at Anneuxre..... to this Attachment-3A28	

(USE SEPARATE SHEET FOR EACH EXPERIENCE/CONTRACT)

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

SECTION - 6

CHECK LIST FOR 420 & 145 KV CIRCUIT BREAKERS

Put a tick mark (√) on 'YES' if the specified requirement is met, or put a tick mark on 'NO', if the specified requirement is not met and give comments in the "Remarks" column.

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
1	Type/class of Circuit Breaker	SF6 / C2M1	YES/NO	SF6 / C2M1	YES/NO	
2	Manufacturer's type designation					
3	Standard Applicable	IEC 62271 - 100	YES/NO	IEC 62271 - 100	YES/NO	
4	Rated Voltage (kV rms)	420	YES/NO	145	YES/NO	
5	Rated Current					
	Under normal condition (A)	(a) 3150 A	YES/NO	(a) 1600 A	YES/NO	
		(b) 2000 A	YES/NO	(b) 1250 A	YES/NO	
6	Max fault level (1 s)	50 kA	YES/NO	31.5 kA	YES/NO	
7	Phase to phase spacing	7000 mm		3000 mm		
8	Rated frequency (Hz)	50	YES/NO	50	YES/NO	
9	Number of poles	3	YES/NO	3	YES/NO	
10	Whether All The 3 poles ganged electrically or mechanically	Electrically	YES/NO	Electrically/ Mechanically (As per see-1)	YES/NO	
11	Whether dead tank or live tank design	Live	YES/NO	Live	YES/NO	
12	No. of break per pole (Bidder to fill)		YES/NO		YES/NO	
13	Rated short circuit breaking current					
	i. Symmetrical component at highest system voltage (kA)	50	YES/NO	31.5	YES/NO	
	ii. DC Component (%)	(a) 49 %	YES/NO	(a) 49 %	YES/NO	
		(b) 36 %	YES/NO	(b) 36 %	YES/NO	
14	Rated short circuit Making Current (kAp)	125	YES/NO	80	YES/NO	

Technical Specification

400KV AND 132KV SF6 CIRCUIT BREAKERS

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
15	Rated break time (ms)	i) 40 ms under test duties 2,3 &4 at rated voltages		60	YES/NO	
		ii) 45 ms under test duties 1 to 5 and short line fault test duties and combined variation of trip coil voltage, operating pressure and quenching media pressure, etc.		-		
	Rated small inductive current Breaking capacity	Corresponding to interrupting steady and transient Breaking capacity magnetising current of 50 to 630 MVA transformers with overvoltage less than 2.3 pu		0.5 to 10 A		
16	Total break time	-		65	YES/NO	
17	Closing time (ms)	150	YES/NO	150	YES/NO	
18	First pole to clear factor	1.3	YES/NO	1.5	YES/NO	
19	Short time current rating (kA) for 1s	50 kA	YES/NO	31.5	YES/NO	
20	Rated operating duty	O-0.3 Sec –CO -3 min –CO	YES/NO	O-0.3 Sec – CO -3 min – CO	YES/NO	
21	Out of phase breaking current	12.5 kA	YES/NO	7.8 kA	YES/NO	
22	Maximum line charging breaking current with temporary over voltage upto 1.4 p.u. (A)	600A at 90° C leading power factor with maximum permissible switching overvoltage of 2.3 pu	YES/NO	As per IEC	YES/NO	

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
23	Maximum over voltage (p.u.) under any switching conditions	2.3	YES/NO	2.3	YES/NO	
24	Maximum pole discrepancy (ms)	Opening – 3.3 ms	YES/NO	Opening – 3.3 ms	YES/NO	
25	Small fault current breaking capacity (kAp)	As per IEC	YES/NO	As per IEC	YES/NO	
26	Maximum temperature rise for main contacts over design ambient temperature of 50°C	As per IEC	YES/NO	As per IEC	YES/NO	
27	Rated voltage & pick up range for trip coil (V)	220 V DC, Range – 70 % to 120 %	YES/NO	220 V DC, Range – 70 % to 120 %	YES/NO	
28	Rated voltage & pick up range for closing coil (V)	220 V DC, Range 85 % to 120 %	YES/NO	220 V DC, Range 85 % to 120 %	YES/NO	
29	Reclosing	Single and three phase high speed auto reclosing	YES/NO	Single and three phase high speed auto reclosing (2 NDS) / Three phase high speed auto reclosing (3 NDS)	YES/NO	
30	Rated terminal load	Adequate to withstand 100 kg static load as well as wind, seismic and short circuit forces without impairing reliability or current carrying capability				
31	Dielectric withstand of complete Breaker					
a)	One minute dry & wet power frequency withstand voltage					
	i. Between live terminal and ground (kV rms)	520	YES/NO	275	YES/NO	
	ii. Between terminals with breaker contacts open (kV rms)	610	YES/NO	275	YES/NO	

Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
b)	1.2/50- micro second impulse withstand test voltage					
	i. Between live terminals and ground (kVp)	±1425	YES/NO	650	YES/NO	
	ii. Between terminals with breaker contacts open (kVp)	1) ±1425(+240)	YES/NO	650	YES/NO	
c)	250/2500 micro second switching surge withstand test voltage					
	i. Between live terminals and ground (kVp)	±1050	YES/NO		YES/NO	
	ii. Between terminals with breaker contacts open (kVp)	1) 900(+350)	YES/NO		YES/NO	
d)	Corona extinction voltage (kV rms)	320	YES/NO	N.A.		
e)	Maximum radio interference voltage for Frequency between 0.5 MHz and 2 MHz	1000 (max) at voltage 266 kV rms.	YES/NO	1000 (max) at 92 kV rms (Micro volts)	YES/NO	
f)	Total creepage distance					
	i) To ground (mm)	1) 10500 for 420 kV	YES/NO	3) 3625 for 145 kV	YES/NO	
	ii) Between terminals (mm)	1)10500 mm for 420 kV	YES/NO	2) 3625 for 145 kV	YES/NO	
32	Pre-insertion resistor requirement					
	Rating (ohms)					
	Minimum pre-insertion time (ms)					
	opening of PIR contacts					
33	Operating Mechanism					
	a) Type of operating mechanism for					
	i. Closing	1) Spring	YES/NO	1) Spring	YES/NO	
		2) Pneumatic	YES/NO	2) Pneumatic	YES/NO	
	ii. Opening	1) Spring	YES/NO	1) Spring	YES/NO	
		2) Pneumatic	YES/NO	2) Pneumatic	YES/NO	

Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
34	General					
a)	Whether OGA drawing enclosed		YES/NO		YES/NO	
b)	Filled in GTP furnished		YES/NO		YES/NO	
d)	Interpole cabling included in Scope alongwith required Glands, Lugs etc.		YES		YES	
e)	All Type Test Reports as per IEC 62271 – 100, not older than 10 years are available with bidder		YES		YES	
f)	Bidder's unconditional acceptance of "Undertaking on Type Test Reports" – enclosed.		YES		YES	
g)	Whether GI support structure included in Supply		YES		YES	
h)	Whether foundation bolts for breakers and cabinets included in scope of supply		YES		YES	
i)	Whether documentation schedule as per attached enclosure agreed by bidder.		YES		YES	
j)	No. of Aux. contacts per pole for purchaser's usage	14 NO + 14 NC	YES		YES	
k)	Min clearance in Air (mm) as per section-3					
	(i) Between Live Parts		YES/NO		YES/NO	
	(ii) Live Part to Earth		YES/NO		YES/NO	
	(iii) Live Part to ground with Support Structure / Stool		YES/NO		YES/NO	
l)	Control Cabinet –					
	Degree of Protection	IP 55 (Min.)	YES/NO	IP 55 (Min.)	YES/NO	
	Type Tested for IP 55 within last 10 years		YES/NO		YES/NO	
n)	Mandatory spares included in scope of supply as per		YES/NO		YES/NO	

Technical Specification
400KV AND 132KV SF6 CIRCUIT BREAKERS

Sl. No.	Parameters	420 kV	YES/NO	145 kV	YES/NO	Remarks
	section 1					
o)	Mandatory maintenance included in scope of supply as per section 1		YES/NO		YES/NO	
p)	Supervision of Erection, testing and commissioning included in scope		YES/NO		YES/NO	