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**VOLUME -I. :: SECTION – VII**

**GENERAL TECHNICAL CONDITIONS OF CONTRACT (G T C)**

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**SECTION - VII  
GENERAL TECHNICAL CONDITIONS OF CONTRACT**

**1.0 GENERAL:**

1.1 This section covers technical conditions pursuant to the contract and will form an integral part of the contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out separately in Technical specifications.

1.2 The definitions in section-IV of Volume-I, (GCC) are applicable to this section also.

**2.0 LIMIT OF CONTRACT:**

2.1 Equipment furnished shall be complete in every respect with all mountings, fittings fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the respective specifications unless included in the list of exclusions. All similar standard equipment provided, shall be interchangeable with one another.

**3.0 ENGINEERING DATA:**

3.1 Furnishing of engineering data by the Bidder shall be in accordance with the "Schedule of Requirements" as specified in the Technical volumes. The review of these data by the Purchaser will cover only general conformance of the data to the specifications and documents interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect equipment layout. This review by the Engineer may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the Engineer shall not be construed by the Bidder, as limiting any of his responsibilities and liabilities for mistakes and deviation from the requirements specified under these specifications and documents.

3.2 All engineering data submitted by the Bidder after final process including review and approval by the Engineer shall form part of the Contract Documents and the entire works covered under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Engineer in writing.

**4.0 DRAWINGS TO BE FURNISHED AFTER AWARD OF CONTRACT:**

- 4.1 Soon after award of the contract, the bidder shall furnish the list of drawings (equipment/material/erection) to be furnished by him in accordance with the specification as required for the scope of Supply, erection & Commissioning.
- 4.2.1 Bidder shall submit for approval, as per the above schedule two sets of assembly drawing erection/construction and sufficient detailed drawings to demonstrate fully that the apparatus furnished and erection/construction work carried out shall conform to the provision and intent of these specifications. Detailed drawings or design data proving the adequacy of the Bidder's designs by calculations shall be submitted for approval by the purchaser.
- 4.2.2 The design data and the drawings submitted by the Bidder will be reviewed by the Purchaser as far as practicable within four (4) weeks of their receipt and shall be modified by the Bidder if any modifications and/or corrections are required by the Purchaser. The Bidder shall incorporate such modifications and/or corrections and submit the final drawings for approval. Any delays arising out of failure by the Bidder to rectify the drawings in good time shall not alter the contract completion date.
- 4.2.3 When revised drawings are submitted for approval, the changes from the previous submittals shall be clearly identified on the drawings, with every revision made during the life of the contract shown by number, date and subject, in a revision block and a notation shall be given in the drawing margin. The drawings shall be clear and legible in all respects. The corrected drawings shall be submitted with soft copies in three sets in CDs.
- 4.2.4 The Purchaser shall have the right to require the Bidder to make any changes in the design which may be necessary in the opinion of the Purchaser to make equipment construction cum erection work conform to the provisions and intent of these specifications, without additional cost to the Purchaser. One set of the drawings marked "APPROVED" will be returned to Bidder. He shall thereupon furnish the Purchaser with ten sets of prints (including one set of tracing cloth and another of velograph), soft copy in CD after incorporating all corrections.
- 4.2.5 Further work by the Bidder shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

- 4.2.6 All manufacturing fabrication work and construction/erection in connection with the equipment before the approval of the drawings shall be at the Bidder's risk. The Bidder may make any changes in the design, which are necessary to make the equipment construction/erection conform to the provisions and intent of the contract, and such changes will again be subject to approval by the Purchaser.
- 4.2.7 Approval of drawings by the Purchaser/Consultants shall not be held to relieve the Bidder of any part of his obligation to meet all the requirements stipulated in the specification of responsibility for correctness.
- 4.2.8 One month prior to dispatch of the equipment final approved drawing sets, operation, maintenance and erection manuals shall be supplied to the Purchaser in 6 copies. Also a soft copy of the drawings in Auto cad version shall also be supplied.
- 4.2.9 The Bidder shall mark in red in one (1) set of drawings all deviations/alterations carried out at site during construction work. After final testing and commissioning, any corrections in the, field test, actual erection, testing and commissioning shall be incorporated in the drawings and the Bidder shall furnish to Purchaser ten (10) copies of the revised drawings/manuals and marked as "As Built" drawings shall be supplied in the Office of the **Chief Engineer/LIS/Vidyut Soudha /Hyderabad**. However, no alternations/ deviations shall be carried out without the prior approval of the Purchaser.
- 4.2.10 The Bidder shall also furnish two sets of reproducible along with soft copy in CD of all reference drawings and documents/designs after approval and two sets of reproducible of all as built drawings as certified by the field engineer of TSTRANSCO.
- 4.2.11 Drawings shall include all installation and detailed piping drawings. All piping 100 millimeter and larger shall be routed in detail and smaller pipe shall be shown schematically or by isometric drawings.
- 4.2.12 Each drawing shall be complete with Bill of Materials and legends. It shall contain technical requirements of quality assurance to be observed at shop and technical requirements for work at site like welding length, weld size, type of electrodes etc.
- 4.3 **QUALITY ASSURANCE PLAN:**
- Contractor shall furnish the Quality Assurance Plan for the Equipment/Material and erection under

the contract (for details refer Cl.No.9.0 of this section).

**4.3.1 DRAWINGS TO BE FURNISHED AFTER THE COMPLETION OF WORK**

After completion of the erection work, the Bidder shall furnish 10 (ten) sets of copies of drawings in bound volumes along with a soft copies in a Pen drive/CD discs, in addition to set of Auto CAD drawings the completion drawings listed below:

- i) All tender drawings specified under this clause 4.1 & 4.2 above,
- ii) Key diagrams and schematic drawings of all piping system, wiring diagrams for all electrical circuits including cabling arrangements, Cable laying and termination schedules etc.
- iii) Detailed drawings of the entire equipment which shall include separate drawings of the entire equipment and of all important component parts of the plant incorporating sufficient details for complete understanding of the design and working of the entire plant and containing all the necessary information required for the erection and maintenance.
- iv) Detailed shop drawings for critical spares.

In addition, such detailed drawings as may be necessary for erection, maintenance, repair, identification of plant components/parts and for making or ordering replacement parts shall be supplied by the Bidder as may be required by the Purchaser. In addition, the VENDOR/CONTRACTOR shall furnish two sets of soft copies in CDs in addition to the full size prints. Sets of above drawings in bound volumes shall contain the copy of the drawings of all the equipment erected including that of TSTRANSCO supplied material.

**5.0 INSTRUCTION MANUALS**

- 5.1 The Bidder shall submit to the Purchaser, instruction manuals for erection of the equipment, covered under the contract before commencement of erection of the same. The instruction manuals shall contain full details and drawings of all the equipment furnished, the erection procedures and testing procedures. These instruction manuals shall be submitted in the form of one reproducible original and copies.
- 5.2 After the commissioning and initial operation of the plant, If the instruction manuals require any modifications/additions/ changes, to the manuals furnished earlier, the same shall be incorporated and the updated final instruction manuals in the form of one reproducible original and ten copies

shall be submitted by the Bidder to the Purchaser.

5.3 The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment as completed shall be supplied well before the commissioning and shall be in sufficient detail containing every drawing and information required for the installation, testing, setting and adjustment of all components after installation, commissioning, operation and maintenance of the equipment and all the components, dismantling and repair besides the data needed for the servicing of the components and ordering the spares. Marked erection prints identifying the component parts of the equipment, as transported, with the assembly drawings. Detailed dimensioned assembly and cross-section drawings and description of all the auxiliaries and drawings identifying all spares for reorder. They shall give a step-by-step procedure for all operations likely to be carried out during the life of the plant/ equipment including erection, testing, commissioning, operation, maintenance, dismantling and repair. Each manual shall also include a complete set of approved drawings together with performance/rating curves of the equipment and test certificates wherever applicable. The 'Contract' shall not be considered to be completed for purposes of taking over until such instructions and drawings have been supplied to the Purchaser.

5.4 A separate section of the manual shall be for each size/type of equipment and shall contain a detailed description of construction and operation, together with all relevant pamphlets, drawings and a list of parts with procedure for ordering spares. Maintenance instructions shall include charts showing lubrication checking, testing and replacement procedures to be carried out daily, weekly, monthly and at longer intervals to ensure trouble free operation. Where applicable, fault location charts shall be included to facilitate finding the cause of mal-operation or breakdown. A collection of the manufacturer's standard leaflets will not be accepted, to be taken as a compliance of this clause. The manual shall be specifically compiled for the concerned project.

#### **6.0 FIRST FILL OF CONSUMABLES, OILS AND LUBRICANTS**

All the first fill of consumables such as oils, Multi purpose grease, Petroleum Jelly, Cotton waste and dungry cloth etc., which will be required to put the equipment covered under the scope of the specifications, into successful operation, shall be supplied by the Bidder unless specifically excluded.

#### **7.0 MANUFACTURING SCHEDULE**

The Bidder shall submit to the Purchaser his manufacture and delivery schedules for all equipment within thirty (30) days from the date of award letter. Such schedule shall be in line with the detailed network for all phases of the work of the Bidder. Such schedules shall be reviewed, updated and submitted to the Purchaser once every two months thereafter, by the Bidder. Schedules shall also include the materials and equipment purchased from outside supplier. They shall also provide the required number of photographs together with the negatives showing the actual progress during various stages of manufacture at no extra cost to the Purchaser.

#### **8.0 DESIGN IMPROVEMENTS**

- 8.1 The Engineer or the Bidder may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.
- 8.2 If any such agreed upon change, is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Bidder proceeds with the change. Following such agreement the provision thereof, shall be deemed to have been amended accordingly.
- 8.3 Any change in design or manufacturing process which the CONTRACTOR/ SUPPLIER incorporates in his produce as a measure of improvement on his own shall not entitle him for any extra payment.

#### **9.0 QUALITY ASSURANCE PROGRAMME**

- 9.1 To ensure that the equipment and services under the scope of this contract whether manufactured or performed within the Bidder's works or at his Subcontractor's premises or at the Purchaser's site or at any other place of work are in accordance with the specifications, the Bidder shall adopt suitable quality assurance programmes to control such activities at all points, necessary. Such programmes shall be outlined by the Bidder and shall be furnished as applicable. A quality assurance programme of the Bidder shall generally cover the following.
- a) His organization structure for the management and implementation of the proposed quality assurance programme;
  - b) Documentation control systems;
  - c) Qualification data for Bidders key personnel;
  - d) The procedure for purchase of materials, parts, components and selection of Sub-Contractor's service including vendor analysis, source inspection, incoming raw-material inspection, testing, verification of materials purchased, etc.

- e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly controls;
- f) Control of nonconforming items and system for corrective actions;
- g) Inspection and test procedure both for manufacture and field activities
- h) Control of calibration and testing of measuring and testing equipment;
- i) System for indication and appraisal of inspection status
- j) System for quality audits;
- k) System for authorizing release of manufactured product to the Purchaser
- l) System for handling storage and delivery;
- m) System for maintenance of records; and
- n) A quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component furnished.

#### **10.0 QUALITY ASSURANCE DOCUMENTS:**

10.1 The Bidder shall be required to submit the following Quality Assurance Documents within before dispatch of the equipment

- i) All Non-Destructive Examination procedures, stress relief and weld repair procedure actually used during fabrication,
- ii) Welder and welding operator qualification certificates,
- iii) Welder identification lists, listing welders and welding operator's qualification procedure and welding identification symbols.
- iv) Material mill test reports on components as specified by the specification.
- v) The inspection plan with verification, inspection plan check points, verification sketches, if used, and methods used to verify that the inspection and testing points, in the inspection plan were performed satisfactorily.
- vi) Sketches and drawings used for indicating the method of trace ability of the radiographs to the location on the equipment
- vii) Non-destructive Examination result, reports including radiography interpretation reports.
- viii) Factory test results for testing required as per applicable codes and standards referred in the specification.
- ix) Inspection reports duly signed by Quality Assurance personnel of the Purchaser and Bidder for the agreed inspection hold points. During the course of inspection, the following will also be recorded:
  - a) When some important repair work is involved to make the job acceptable; and
  - b) The repair work remains part of the accepted product quality.

#### **11.0 ENGINEER'S SUPERVISION:**

11.1 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 Engineer and his decision shall be final.

11.2 The work shall be performed under the direction and supervision of the Engineer. The scope of the duties of the Engineer, 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 Bidder's drawings, engineering data etc.;
- c) Witness or his authorized representative to witness tests and trials either at the manufacturer's work 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 improvements in-completion schedules from time to time; and
- g) Supervise the quality assurance programme implementation at all stages of the works.

**12.0 DEPARTURE FROM SPECIFICATIONS:**

12.1 While the Purchaser does not bind himself to accept the lowest or any other Bid, Due consideration shall be given to any special devices or equipment put forward by the Bidder with a view to increase the efficiency of the plant and to minimise the initial or maintenance cost of the plant as a whole.

**13.0 TOOLS & PLANTS:**

13.1 A complete outfit of tools, spanners, torque renches, powered hand drills , gauges, slings and other lifting devices, instruments and all other appliances necessary or convenient for the complete assembly, erection at site, dismantling and maintenance of the plant along with racks for holding them shall be supplied and included in the Contract. Spanners shall be single ended and made to fit each size, of nut and bolt of the plant. Two sets of spanners, tools and appliances etc,. as indicated in this specification shall be supplied. He shall also provide a durable storage box with lock for such tools. The prices for all items are deemed to have been included in the quoted bid price and no separate payment shall be made for these items. The details including make of Tools & Plants offered shall be given in the bid.

**13.2 ERECTION AND MAINTENANCE TOOLS:**

The tenderer is responsible for maintaining the required erection tools.

**14.0 EXTRA WORK:**

- 14.1 The Bidder shall, when asked in writing by the Purchaser, perform extra work and furnish extra material not covered within the scope as per specifications. Payments for such extra work or material shall be as per the provisions of General conditions of specification.

**15.0 STANDARDS:**

- 15.1 All material and equipment shall comply in all respects with the requirements of the latest edition of the relevant Indian, International Electro-Technical Commission (IEC). Commodities meeting Japan Industrial Standards (JIS) and other internationally accepted standards, which ensure equal or higher quality than the standards mentioned will also be accepted. However, wherever standards other than those specified are adopted, two copies of English Version of such Standards are to be enclosed to the Bid.
- 15.2 Where a certain equipment is stated not to comply with the Indian, IEC or any other equivalent standard, the salient points of comparison between the standard adopted and those mentioned above shall be clearly brought out in the Bid making at the same time necessary corrections for operation under the conditions specified herein. Wherever a standard is specifically mentioned in these specifications, it is understood that the corresponding standard or standards from amongst the source mentioned above shall also apply. It is, however, understood that the plant and equipment offered shall comply with one consistent set of standards except as far as they are modified by the requirements of these specifications.
- 15.3 In case of a conflict between such codes and/or standards and the specifications, the latter shall govern. Such codes and/or standards referred to shall mean the latest revision, amendments/changes adopted and published by the relevant agencies. In cases of any further conflict in this matter, the same shall be referred to the Engineer, whose decision shall be final and binding.
- 15.4 For verification and according approval of the documents in respect of Technical data/ designs & drawings, test certificates of the equipment and material offered for Supply/ erection in the contract, the bidder shall support these documents with relevant Standards and Codes wherever requested by the Purchaser.

**16.0 MANUFACTURER'S STANDARDS:**

16.1 The general principal on whom these specifications are drawn up is to permit the adoption of modern manufacturing standards. The Bidders are requested to tender for their own standard equipment so far as possible provided these comply with the requirements of these specifications. However, should Bidder wish to depart from the provisions of these specifications either on account of manufacturing practice or for any other reasons, he shall draw the attention of the Purchaser to the proposed points of departure and shall submit such full information, drawings and specifications as will enable the relative merits of his proposals to be fully appreciated.

16.2 In the event of these specifications or a part thereof and the Bidder's drawings, specifications, forms, tables etc. being found to disagree during the execution of the Contract, these specifications shall be held as binding unless the departures have been duly approved in writing by TSTRANSCO.

**17.0 FOUNDATION AND FIXTURES:**

17.1 Designs for foundation and supporting structures for all equipments shall be prepared by the Bidder. All fixtures necessary for proper erection of embedded parts shall be supplied by the Bidder.

**18.0 MATERIALS AND WORKMANSHIP:**

**18.1 GENERAL**

18.1.1. All parts shall be manufactured true to drawing's dimensions. All tolerances shall be defined on the Bidder's drawings for both manufacturing and installation purposes. Holes shall be drilled full size or under size and reamed during shop assembly. Punched holes will only be permitted in plates 16mm or less in thickness, provided all such holes are subsequently reamed full size during shop assembly.

18.1.2. The materials used in the construction of the equipment/material shall be new, of high quality and selected particularly to meet the duties required of them. The material specification shall be indicated in Bidder's detailed drawings. The use of materials liable to attack by termites or other insects shall not be allowed. All workmanship shall be of the highest quality throughout to ensure smooth and vibration free operation under all possible operating conditions and the design, dimensions and materials of all parts shall be so chosen that the stresses to which they may be subjected shall not render them liable to distortion or damage under the most severe conditions encountered in actual service.

18.1.3 Materials and workmanship shall conform to the latest editions of the IEC/ISS standards.

## 18.2 PIPING

18.2.1. All pipes and fittings supplied by Bidders shall conform to the appropriate standards.

18.2.2 Each piping system shall be provided with an adequate number (to be approved by the Purchaser) of valves, drain plugs/ cocks, test plugs/ cocks, sight flow indicators, meters etc. so as to ensure ease and flexibility of operation coupled with reliability, soundness and ease of maintenance of the system.

18.2.3. All piping shall be clean inside and where ending in open connection for other work, the piping shall have the ends capped for protection. Valves shall be easily accessible and gauges and other operating or indicating devices shall be located so that they can be conveniently operated or read from the floor walkways. Valves shall be suitable for the services intended. Either blind companion flange or a pipe plug shall be provided, wherever necessary, to protect valves. Where piping systems must be disconnected for servicing, flanges or unions shall be provided and the piping, valves and joints shall be arranged for minimum disturbance or interference with other parts during such operation.

18.2.4. As far as possible, the pipes shall not be embedded but shall run in trenches or shall be suitably supported by hangers, brackets, hooks, pedestals, or any other support suited to the requirement, care being taken to avoid vibration at the supports. An adequate allowance for the expansion of pipes under service conditions shall be made. Each pipe shall be kept suitably sloped to facilitate drainage and shall be suitably lagged where necessary. The material of piping for different services shall be stated in the Bid.

18.2.5. Flexible pipe connections to apparatus shall be provided wherever necessary.

18.2.6. For ready identification of different piping systems and their functions, each piping system shall be painted in code colors (to be approved by the Purchaser). All operating points and each separate section shall also be painted with two bands of approved coded colors, the wide band twice the width of the narrow one. An arrow showing the direction of flow shall be marked, generally the narrow band shall be in the direction of flow.

18.2.7. All operating valves on a piping shall also be painted with the same code colour. Each valve shall have, fitted to it, a suitable nameplate indicating the function of the valve.

**18.3 FASTENINGS:**

18.3.1. Nuts, bolts, studs and washers for incorporation in the plant shall conform to the requirements of the appropriate standards, where the contract includes nuts and bolts of different standards, then the tools shall be provided in compliance with this specification and shall include spanners. Taps and dies for these nuts and bolts. Nuts and bolts for pressure parts shall be of the best quality bright steel, machined on the shank, under the head and nut. All washers shall be included under the contract, including locking devices and anti-vibration arrangements. Taper washers shall be fitted, wherever necessary. Where there is risk of corrosion, bolts and studs shall be finished flush with the surface of the nuts. Bolts except for high strength friction grip bolts shall be designed so that with the nuts fully tightened, the stress intensity at the bottom of the thread shall not exceed half the yield point of the material under all conditions. All bolts, nuts and screws that shall be subjected to frequent adjustment or frequent removal in the course of operation shall be made of corrosion resistant steel or bronze. Spring type washers will not be permitted where they may damage any protective coatings. Special tools, wrenches and devices found to be necessary for the completion of the work shall be also provided under this Contract.

**18.4 FORGINGS:**

18.4.1 All forgings in excess of 150 mm. in diameter shall be subjected to examination internally for the detection of flaws and heat treatment for the relief of residual stresses. Particulars of the heat treatment proposed for all forgings shall be submitted to the Purchaser.

**18.5 CASTINGS:**

18.5.1. The parts of cast steel shall not contain damaging defects and shall be satisfactorily cleaned before use. The surfaces which are not machine-finished and which will be exposed after their final installation shall be such that grinding at the site will not be required before painting. The presence of defective material shall be determined and it shall be removed down to sound metal. The cast parts shall be homogeneous and free from excessive nonmetallic inclusions. An excessive concentration of impurities or a separation of the alloy elements in the critical points of a cast part shall be sufficient reason for its rejection.

18.5.2. The castings of the main parts, including all those subject to hydraulic pressure and all castings which undergo a major repair, shall be tested using radiographic, ultrasonic, dye penetration, magnetic particle or any other standard non-destructive test method. The expenses incurred on

such tests shall be to the Bidder's account.

18.5.3. Minor defects or imperfections which definitely do not affect the strength or utilization of the cast parts may be repaired by welding, according to the accepted practice for the repair of such parts.

18.5.4. Thickness and other dimensions of the cast parts shall agree substantially with the dimensions shown on the drawings and shall not be reduced by shop or casting practices to such an extent that the effective strength of the cast parts do not exceed the stresses allowed by these specifications.

18.5.5. Use of cast iron for parts subjected to tension or impact shall not be permitted without the approval of the Purchaser.

#### 18.6 WELDINGS

18.6.1 Bidder shall specify clearly on all relevant drawings, the amount and type of material for each type of weld. Bidder shall also provide detailed drawings showing joint preparation required for each type of welding to be carried out on site and at manufacturer's works.

#### 18.6.2 PREPARATION OF BASE MATERIALS

The parts to be jointed by electric welding shall cut precisely to the correct size by machine methods suitable for the type of weld to be used and to allow the proper penetration and good fusion of the weld with the base metal. The cut surfaces shall not have visible defects such as scales; superficial defects caused by shearing or torch cutting operation or any other damaging defect. The surfaces of the edges to be welded shall be free from rust, oil, grease and other foreign matter.

#### 18.6.3 ELECTRODES

Bidder shall indicate on the detailed drawings, the type, sizes and material of electrodes he proposes to use for shop and/or field welding. Unless otherwise stated, all non-destructive tests shall be carried out. All major welding and all welding carried out on tanks and vessels that will contain liquid under pressure or compressed air shall be subjected to a 100% radiographic examination. In those cases where it is impossible to carry out radiographic inspection, it may be replaced by ultrasonic examinations or by other non-destructive test systems.

#### 19.0 ELECTRICAL EQUIPMENT - General:

The various auxiliaries and controls shall be suitable for 415/240 Volts,. A.C. 50 Hz and 220 V D.C. supplies respectively.

**20.0 PUMPS:**

- 20.1 Unless otherwise specified, all pumps shall be directly coupled to driving motors and their type, capacity and performance shall be best suited to the requirements. The efficiencies of the pumps shall be as high as practicable consistent with good design. As far as possible, the pumps shall be of standard size to facilitate replacement of parts. The pumps shall be of the self-priming type. If however, any external means of priming are employed, these shall be stated in the Bid and shall be subject to the approval of the Purchaser.
- 20.2 Driving motors to which pumps are coupled shall conform to the general standards laid down in this specification. Gear motors, if employed, shall be subjected to the Purchaser's approval. The pumps capacities and the rating of the driving motors shall have liberal margin over the requirements.
- 20.3 All pumps shall be designed and constructed to ensure a quiet and satisfactory operation without undue noise or vibration under all conditions of discharge and pressure. Centrifugal pump casings shall be designed to produce smooth flow with gradual changes in velocities. The pumps shall be equipped with adjustable pressure relief bypass or unloading valves to protect against excessive pressure in case of blockage in the discharge line. In addition, the pumps shall be easily removable and replaceable. Suitable gaskets shall be provided for all pipe joints to ensure that they are leak proof. If any strainers are required with the pumps, these shall be included in the Bid and be duplex type to enable periodic cleaning.
- 20.4 All pumps shall be complete with the necessary piping, both on the suction and delivery sides and with all fittings suited to the size and duty of the pump. Adequate number of valves as stated earlier shall be furnished with each pumping unit to suit its operation and maintenance. Wherever necessary, pumps shall be provided with suitable flow meters or flow indicators and pressure gauges to measure the discharge and the pressure delivered by the pumps. Suitable eyebolts or lifting lugs shall be provided on each pumping set to facilitate handling.

**21.0 ELECTRIC MOTORS AND MOTOR CONTROL GEAR:**

- 21.1 All motors furnished by the Bidder, for driving the unit auxiliaries and other apparatus, shall be directly coupled to the apparatus driven and shall be suitable for operation on either (i) 415 volts, 3

phase 50 Hz AC or (ii) 240 volts, single phase, 50 Hz AC or (iii) 220 volts DC supply, as specified in the relevant clauses of this specification. All equipment offered by the Bidder shall operate safely and satisfactorily at any voltage +/- 10% of the above-specified voltage. The enclosure of each motor shall be of the type best suited to the service conditions of the motor and shall be subject to the approval of the Purchaser in every case. The motor shall generally conform to the relevant Indian or IEC/other equivalent standards. The insulation shall be moisture, oil and oil vapour proof and the motors shall be entirely suitable for the operation in the tropical climatic conditions prevailing at site. The motors shall conform to the specification detailed in Section "Auxiliaries".

- 21.2 Motor shall be provided with closed conduit box suitably located for ease of access and with eyebolts or lugs for lifting. The terminal box shall be fitted by means of terminating the external wiring for outdoor use. Varnished cambric or glass insulation shall be used for connections from the windings to the terminals. All motor-terminals shall be of the stud type and totally enclosed.
- 21.3 The capacity, speed and torque characteristics of the motors shall be suitable for the starting and operating requirements of the associated apparatus.
- 21.4 Necessary starting, protective and control gear shall be furnished by the Bidder with each motor. Instantaneous and thermal overload protection shall be provided for the motors together with remote indication of the operation of the protective gear, wherever necessary. In the case of essential motors, stoppage of which would result in serious damage, the thermal overload protection devices shall be arranged to give alarm only without disconnecting the motors. Red and green indicating lamps shall be furnished for indication of the closed and open positions respectively of motor contactors. The control and indication equipment shall be suitable for operation with 220 volts DC supply.
- 21.5 Special type of motors, not adequately covered by this specification, may be offered for any special application, but these shall be subject to the approval of the Purchaser.

**22.0 SMALL WIRING:**

- 22.1 All small electric wiring of the various equipment panels, etc. shall be completed at the manufacturer's work as far as possible. All small wiring shall be arranged neatly into flat or rectangular groups and shall be adequately supported with cleats etc. The small wiring shall be so arranged as to reduce the number of bends or crossing to a minimum. There shall be no splices in the wire and all connections shall be made at the terminal studs or terminal blocks. Similar circuits



shall be arranged to terminate as far as possible, on adjacent terminals to facilitate grouping and to minimise the number of interconnecting cables. Secondary or control wiring including leads from the current transformers, temperature detectors, alarm contacts, speed and pressure switches etc. shall be enclosed in conduits and shall be carried to dust and water proof and oil tight cabinets located conveniently for connection to the control cables.

22.2 Pressure circuits shall be suitably protected so that failure of one circuit shall not cause the progressive failure of adjacent circuits. Alternating current circuits, direct current circuits, and circuits operating at different voltages shall be grouped separately and the wiring for each of these groups shall preferably be segregated.

22.3 For the purpose of easy identification, tracing and reconnection, the wiring shall be colour coded and shall be fitted near the terminals with ferrules or such other cap indelibly marked with the identification number corresponding with that of the associated terminal blocks. When an electrical circuit is extended to several pieces of equipment necessitating sectionalising of circuit wiring at the terminal blocks of the corresponding equipment, common identification numbers shall be used for the designation of the circuits at all the terminal blocks and connections. The terminals and circuit designations for all wiring shall be subject to the approval of the Purchaser.

22.4 All small wiring of voltage of 1100V shall be switch board type single conductor, tinned annealed copper wire, PVC insulated cables as per relevant Indian or International Standards, insulated with varnished cambric, which has proved its utility in tropical region against hot and moist climatic conditions and vermin, complying with the relevant International Standards. All small wiring shall have oil vapour-proof insulation. The sizes of the wiring for different circuits shall be so chosen as to provide ample margin for the purposes intended and shall be subject to the approval of the Purchaser.

### **23.0 MEASURING INSTRUMENTS:**

23.1 All instruments and meters shall be suitable for operation under the climatic conditions prevailing at site. The instrument cases shall be dust proof, water tight, vermin proof and specially constructed to adequately protect the instruments against damages for deterioration due to high ambient temperatures and humidity, special care being taken in the protection of instruments for outdoor service. The details, pointers etc., shall be designed to facilitate accurate reading by minimising parallax and glare from instrument window and by providing clear, bold dial markings.

The size of dial and length of the scales of indicating instruments shall be subject to the approval of the Purchaser in each case. The scale of the indicating instrument shall cover approximately 300 degrees movement of the indicator. The scale plates of panel mounted indicating instruments shall have a permanent white matt finish with black graduation. The pointers or the pointer indicating contact setting (in contact working instruments) shall be distinguished from the main pointer by a distinct colour and/or shape. The current transformer shall be designed for secondary current of One Ampere and Voltage transformer shall be designed for secondary voltage of 110 volts unless specified otherwise.

- 23.2 Instruments mounted on panels shall be of the semi flush type and shall be back-connected. All instruments on a switchboard or instrument panel shall be of matching pattern, shape and finish to present a pleasing appearance consistent with the functional requirements. The finish of the instrument case shall be subject to the approval of the Purchaser. All instruments shall be designed for accurate measurement of the quantity or state under all conditions of operations and any errors due to change in the ambient temperature, over the entire range of temperatures obtainable at site, shall be kept to a minimum. The instruments shall be provided with all the auxiliary appliances and any special tools required for their maintenance.
- 23.3 The metric units shall be used for marking the instrument dials. The range shall generally be such that the normal operating values are indicated in the middle third of the scale.
- 23.4 All electrical instrument coils shall be designed for continuous operation on at least 110 percent of the full rated current and for potential of the instruments. The instrument coil rating shall be coordinated with those of the associated instrument transformers.
- 23.5 The VA burden of instrument coils shall be as low as possible, consistent with the best modern design.
- 23.6 Electrical indicating instruments shall comply generally with the requirements of the Indian/IEC or any other International Standards and shall be of the accuracy specified in relevant sections.
- 23.7 Recording instruments shall be of the strip chart type with chart scales having suitable width. The charts shall be gear-driven by a self-starting synchronous motor wound spring device having ample torque even at reduced voltage and with at least 8 hours spring reserves. The device for producing the record on the chart shall be a reliable ink recording or printing type and shall produce clear, legible record under all normal conditions of operation. The recording instruments shall be of

withdrawal type for easy access to maintenance work. Sufficient number of chart rolls, recording ink for two years of operation and any special tools required for the maintenance of the instruments shall be furnished with each recorder.

23.8 Integrating watt-hour meters shall comply generally with the requirements of the International Standards and shall be first grade for the purpose of accuracy classification.

23.9 Contact making instruments shall have contacts suitable for 240 Volts, A.C. or 220 Volts D.C.Circuits.

23.10 All instruments shall have as high accuracy as possible consistent with best modern design. The construction of instruments shall be mechanically sound and shall ensure permanence in the accuracy. The limits of error for different instruments shall be stated in the Bid and their accuracy classification, where otherwise not specified, shall be subject to the approval of the Purchaser. All instruments shall be tested in accordance with the requirements of the standard, wherever specified. In case where no specific standards are mentioned, the Bidder shall submit the list of the standards in accordance with the Instruments proposed to be manufactured and tested and these shall be subject to the approval of the Purchaser in every case.

23.11 The instruments shall be capable of withstanding the following tests viz. effect of shock, effect of vibration and effect of humidity and dielectric tests of 2000 volts RMS to ground for one minute in accordance with relevant standards.

**24.0 EARTHING:**

24.1 The Bidder shall provide suitable earthing terminals on all the equipment supplied under the Contract and shall connect the earthing conductors to these terminals as approved or directed by the Purchaser.

24.2 Unless specified otherwise, the earthing conductors from the station earthing bus to the equipment will be provided by the Bidder and shall provide suitable test terminals at convenient points of the equipment to enable periodic testing the resistivity and insulation level of the equipment.

**25.0 UNITS:**

25.1 Metric units according to the latest edition of the relevant Indian/IEC publications shall be used for this Contract.

25.2 For the purpose of design/calculations, M.K.S. units shall be used.

**26.0 DESIGN AND STRESSES:**

26.1 The design, dimensions and materials of all parts of the equipment shall be such that they will not suffer damage under the most adverse service conditions. Mechanism shall be so constructed as to avoid sticking due to rust or corrosion.

26.2 The Bidder shall be responsible for an adequate design. The principal stresses in the materials used shall be indicated in the Bid.

26.3 The equipment shall be designed for operation in an earthquake zone. The equipment and each part of it shall be strong enough and sufficiently well connected to resist total operating stresses, including any stress resulting from an earthquake.

26.4 All equipment shall be designed to:

- i) Minimise the risk of fire and any consequential damage;
- ii) Prevent accidental contact with live parts;
- iii) Be capable of continuous operation or as required with minimum attention and maintenance under the conditions prevailing in a power development in a tropical climate.

26.5 The Bidder shall provide complete information regarding maximum unit stresses used in the design.

**27.0 PROTECTION:**

27.1 All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a nonmetallic protecting device. Ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather shall also be properly treated for normal life and satisfactory operation under the climatic condition prevalent at the site and shall be dust and vermin proof. All parts and surfaces which are subject to corrosion shall be made of such material and shall be provided with such protecting finish as would protect the equipments installed from any injurious effects of excessive humidity. All electrical auxiliary equipment shall be specially

treated for tropical conditions and the materials and methods for this treatment shall be got approved in advance.

**28.0 PRESERVATIVE SHOP COATING:**

- 28.1 All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces, which will not be easily accessible after the shop assembly, shall beforehand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scale, oxide and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. All important component parts shall be specially protected with a protective coating and other measures to ensure prevention of rusting of the machine surfaces during storage of the material before erection. Any special instructions for inspection and maintenance of such vital parts during storage deemed necessary by the Bidder to ensure the protection of such parts shall be supplied well in advance of the supply of such vulnerable parts. Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade resistance enamel. The finished colour shall be as per manufacturer's standards, to be selected and specified by the Engineer later.
- 28.2 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Engineer.
- 28.3 Switchgear and all the auxiliary plant shall be given two coats of finishing paint of approved colour over a coat of filler paint. Outdoor equipment and all the allied plant shall be given two priming coats of approved rust resisting paint in plain colour before packing. Parts not so painted shall be protected against deterioration during shipment. All bright steel parts shall be given a thick coat approved rust resisting paint in plain colour to prevent rusting during shipment and transport. All gun metal or brass parts shall be coated with a removable dark paint as a precaution against pilferage during transit. All unfinished surface in contact with oil shall be cleaned and painted with a special oil resistant paint.
- 28.4 All the seams and joints which will be riveted together at site shall be given a coat of varnish before dispatch from manufacturer's works. The interior metallic surface of oil filled apparatus shall be treated with oil resistant paint or varnish after thorough cleaning. Sufficient quantity of finishing paint shall be supplied for applying two further coats to all the parts, which are painted with unfinished paint after the complete erection of the machinery.

**29.0 GALVANISING:**

- 29.1 All materials to be galvanised shall be of the full dimensions shown or specified and all punching, cutting, drilling, screw tapping and the removal of burrs shall be completed before the galvanising process commences. All galvanising shall be done by the hot-dip process with smelter of purity not less than ninety-nine point nine five percent (99.95%) as per IS: 209 of which must be pure zinc. No alternative process may be used without the approval of the Purchaser. No components shall be galvanised which are likely to come into subsequent contact with oil. Bolts shall be completely galvanised including the threads, but the threads shall be left uncoated in the case of nuts. The zinc coating shall be uniform, clean, smooth and as free from spangle as possible. The fabricated tower(Main Structure) and equipment structure parts and stubs shall have a minimum overall zinc coating of 610 gms/sq.m of surface area. The average zinc coating for all sections and plates shall be maintained as 80 microns. All galvanising shall comply with the requirements of the relevant Indian or ASTM standards. All galvanised parts shall be protected from injury to the zinc coating due to differential aeration and abrasion during the period of transit, storage and erection. Damaged areas of the coating shall be touched up with an approved zinc-Rich paint or other approved flake metallic compound.

**30.0 PROTECTIVE GUARDS:**

- 30.1 Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purpose.

**31.0 DESIGN COORDINATION:**

- 31.1 The Bidder shall be responsible for the selection and design of appropriate equipment to provide the best-coordinated performance of the entire system. The basic requirements are detailed out in Technical Specifications. The design of various components, subassemblies and assemblies shall be so done so that it facilitates easy field assembly and maintenance. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical at or close to the operating range of the unit. The Vendor/Contractor shall cooperate with other Bidders executing other works of the project in coordinating design by exchange of information and such other ways.

Design /drawings provided by the Bidder for its suitability for Erection, Testing and commissioning and for satisfactory operation.

**32.0 COORDINATION MEETINGS:**

32.1 The Bidder will be called upon to attend coordination meetings with the Engineer, other Bidders and the Consultants of the Purchaser during the period of Contract. The Bidder shall attend such meetings at his own cost at a place mutually agreed as and when required and fully cooperate with such persons and agencies involved during those discussions.

**33.0 ELECTRICITY RULES, ACTS and Local Legislations:**

33.1 All works shall conform to the rules in force under the latest Indian Electricity Act, Electricity Rules and other applicable legislations.

**34.0 COOPERATION WITH OTHER MANUFACTURERS:**

34.1 Bidder shall exchange, with other manufacturers of items not covered in this specification or alternatively covered in these specifications but forming partial supply of others, all necessary drawings, templates, gauges and other information required to ensure the complete and proper design and coordinated manufacture of all connecting or related parts of the various equipment.

**35.0 COORDINATION WITH OTHER CONTRACTORS:**

35.1 It is envisaged that there will be a number of areas where there would be an inter-link between equipment to be supplied under this contract and equipment proposed to be purchased from other enquiries. The Bidder shall cooperate with the Purchaser to coordinate with all other manufacturers involved in design, control & instrumentation system which will perform the role contemplated without any problem. There shall be no extra cost payable for performing this role.

**36.0 STORAGE AT SITE:**

36.1 Complete instructions regarding the storage of the equipment/material at site shall be furnished by the Bidder. If at any time after the arrival of equipment/material at site, Bidder or his representative desires to draw the attention of the Purchaser to the conditions of storage, which in

his opinion might affect the state of the equipment stored, he shall do so in writing to the Purchaser. However, where supply cum erection is specified, storage is the responsibility of the Bidder.

**37.0 RATING PLATES, NAME PLATES AND LABELS:**

37.1 A rating plate of non-corrodible material shall be attached to each major and auxiliary item of equipment supplied. This plate shall be permanently engraved with the designed full load ratings, serial number, type number, date of manufacture and other identification deemed necessary. Where necessary, diagram plates shall also be supplied.

37.2 A nameplate shall be provided to identify the service of all items of plant supplied. The identifying inscription shall be approved by the Purchaser. Devices shall be identified by nameplates on both front and rear of all desks, panels, cubicles etc.

**37.3** Nameplates or labels shall be manufactured of non-hygroscopic material with engraving of a contrasting colour or alternatively for indoor use of transparent plastic material with lettering engraved on the back and filled with enamel. These shall be in English language only. **Phase markings, equipment identification marking/numbering, display boards, key boards showing the layout of Substation equipment shall be provided by the Bidder.**

**38.0 COMMISSIONING CUM ACCEPTANCE TESTS:**

38.1 On completion of erection of the equipment/material and before commissioning, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Purchaser and the Bidder for correctness and completeness of installation and acceptability for commissioning, 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 Bidder's quality assurance program.

38.2 The Bidder's commissioning engineers, specifically identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests. 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 system.

38.3 The specific tests to be conducted on equipment have been brought out in the specifications.



38.4 The Contractor in charge of erection testing and commissioning shall provide, at free of cost, all testing instruments, control equipment etc. for conducting above tests, in fully calibrated condition along with valid Calibration Certificates. The Purchaser reserves the right to get the testing instruments/control equipment recalibrated before the test at a laboratory of his choice at the cost of the Bidder. The Purchaser will apply proper corrections in calculations, to take into account conditions that do not correspond to the specified conditions.

38.5 Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Bidder, free of cost.

38.6 The guaranteed performance figures of the equipment shall be provided by the Bidder during these commissioning and acceptance Tests. Should the results of these tests show any decrease from the guaranteed values the Bidder shall modify the equipment as required to enable it to meet the guarantees. In such case, commissioning and acceptance Tests shall be repeated within one month, from the date the equipment is ready for re-test and all costs for modifications including labour, materials and the cost of additional testing to prove the equipment meet the guarantee, shall be borne by the Bidder.

38.7 TEST CODES:

The provisions outlined in the IEC test codes or other international and Indian standards and approved equivalents shall generally be used as a guide for all the above test procedure unless otherwise specified in the technical specifications.

38.8 TAKING OVER

Upon successful completion of all the tests to be performed at Site on equipment furnished and erected by the Bidder, the Purchaser shall issue to Bidder a taking over certificate as a proof of the final acceptance of the equipment. Taken over certificate will be issued by the Purchaser after all the as built drawings, equipment drawings, test reports, instruction manuals, O & M manuals, installation drawings, bill of material, shop floor drawings, reconciliation etc. are done and certified by the Field engineer of TSTRANSCO. Such certificate shall not un-reasonably be withheld nor will the Purchaser delay the issuance thereof because of minor omissions or defects, which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificates shall not relieve the Bidder of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate. However, besides the specified

conditions may be imposed and agreed to between the Purchaser and the VENDOR/CONTRACTOR depending on the outcome of the 'Performance Tests'.

**39.0 SEISMIC FORCES:**

The equipment shall be designed to withstand seismic forces corresponding to the seismic Zone in accordance with IS: 1893. Details of the calculations made for the designs of the various equipment taking into account the above seismic forces shall be furnished by the contractor to the Purchaser.

**40.0 CORRESPONDENCE:**

40.1 Any notice to the vendor/contractor under the terms of the 'Contract' shall be served by as well as the site Incharge as applicable, by mail/fax or by hand at the Vendor's / Contractor's principal place of business.

40.2 Any notice to the Purchaser shall be served at the Purchaser's/Purchaser's principal office in the same manner.

**41.0 HANDLING ARRANGEMENTS:**

Unloading of supplied materials at stores/site as specified, falls under the scope of supply of Bidder. Bidder has to make his own arrangements at stores/site for unloading the equipment/materials. No handling facilities from Purchaser's side will be made available either on rent or free of cost.

**42.0 MISTAKES IN DRAWINGS:**

42.1 The Vendor/Contractor shall be responsible for any discrepancies, errors, or omissions in the drawings and other particulars supplied by him, whether such drawings and particulars have been approved by the Engineer or not.

**43.0. INSPECTION AND FACTORY TESTS**

43.1.1 The Engineer, his duly authorized representative and/or 3<sup>rd</sup> Party inspection agency acting on behalf of the Purchaser shall have at all reasonable times access to the Bidder's premises or Works and shall have the power 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 at other premises or works, the Bidder shall obtain from the Purchaser

and/or his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Bidder's own premises or works. **The Purchaser reserves the right to witness any or all type (if any), acceptance and routine tests specified, for which at least 21 (twenty one) days notice in advance shall be given by the Bidder. Bidder shall ensure before giving notices for type test that all drawings and quality plans have been got approved.** The equipment shall be dispatched to site only after approval of test certificates by the Purchaser.

43.1.2 The Bidder shall give the Purchaser twenty one (21) days' written notice of any material being ready for testing, for each stage of testing as identified in the approved quality plan and CIP. Such tests shall be to the Bidder's account except for the expenses of the Inspector. The Purchaser/Inspector, unless witnessing of the tests is virtually waived, will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/inspection, failing which the Bidder may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Purchaser six copies of duly certified test reports.

43.1.3 The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Bidder, of any objection to any drawings and/or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Bidder shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser giving reasons therein, that no modifications are necessary to comply with the Contract.

43.1.4 When the factory tests have been completed at the Bidder's or Sub-Contractor's works, the Purchaser shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser the certificate shall be issued within fifteen (15) days of receipt of the Bidder's Test certificate by the Purchaser. Failure of the Purchaser/ to issue such a certificate shall not prevent the Bidder from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment, should it on further tests after erection, be found not to comply with the Contract.

43.1.5 In all cases where the contract provides for tests whether at the premises or works of the Bidder or of any Sub-Contractor, the Bidder except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel water, stores, apparatus and instruments as maybe reasonably demanded by the Purchaser/Inspector or his authorized representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to

the Purchaser/Inspector or to his authorized representative to accomplish testing.

43.1.6 The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Bidder in respect of the agreed quality assurance programme.

43.1.7 Material Inspection Clearance Certificate (MICC) shall be issued by the Purchaser after inspection of the equipment. Purchaser may waive off the presence of Purchaser's inspecting engineer. In that case, test will be carried out as per approved QP & test certificate will be furnished by the Bidder for approval. MICC will be issued only after review & approval of the test reports.

43.1.8 The Purchaser will have the right to insist on any test(s) of reasonable nature carried out at Bidder's premises or at site or in any other place to satisfy that the material comply with the specification.

43.1.9 The Purchaser reserves the right for getting any field tests conducted on the completely assembled equipment at site.

#### 43.2 FACTORY TESTS

The equipment offered shall be of type tested and shall be subjected to all routine and acceptance tests as per the relevant standards specified.

#### 43.3 ROUTINE TESTS:

43.3.1 After completion of manufacture of the equipment routine tests shall be performed as per relevant standards and requisite copies of test certificates shall be furnished to the Purchaser.

43.3.2 Various components of the equipment shall be routine tested in accordance with approved standards and manufacturer's standards.

43.3.3 Each completely wired cubicles/Panels shall be tested to ensure that all of its protective control systems are satisfactorily functioning as required.

#### 43.4 TYPE TESTS:

43.4.1 The equipment/material offered against this tender should have been successfully type tested in line with the specified standards and this Technical Specification. These tests should have been conducted within a period of 5 years prior to the date of opening of the Part-I "Pre-qualification and Technical Bid", subject to no alteration in the design. The Bidder shall furnish 3 copies of the Type test reports within 15 days of Letter of Indent. In case these type tests were carried out

earlier to the five years period mentioned above or some type tests were not carried out at all as per the present specification, all the relevant type tests as per relevant standards shall be carried out by the successful Bidder in the presence of Purchaser's representative at the cost of the successful Bidder.

- 43.4.2 If there is any change in the components or design in the equipment since after earlier passing of the Type Test, the Bidder shall bring out in his offer all such changes made in the components, materials, designs, etc. In such case the Bidder shall carry out the type tests at his cost and in presence of the Purchaser's representative.

If any change in design was made, latest type tests shall be furnished along with approved drawing.

- 43.4.3 The Purchaser reserves the right to conduct tests included in the list of Type Tests in the respective technical specifications on requisite number of samples/items from any of the lots during the tenure of the supply, at Purchaser's cost in the presence of Purchaser's representatives. If the equipment/material does not withstand the type test, the equipment/material supplied till then will be liable for rejection. The supplier, in such an eventuality, shall be allowed to modify the equipment and type test the same again at his cost in the presence of the Purchaser's representative. These type tests shall however be conducted by the Supplier within a reasonable time. After successful passing of the type tests, all the equipment/materials supplied earlier shall be modified in line with the equipment/materials which has successfully passed the type test. In case Supplier fails to carry out the type test within reasonable time or does not agree to carry out the type test at his cost his equipment/material supplied earlier shall be rejected and order placed shall be cancelled and payment made earlier for these Suppliers shall be recovered by the Purchaser.

- 43.4.4 The type tests should have been either conducted in a recognized institution or laboratory and should have been witnessed by a purchaser or an independent agency. The name(s) of the institutions/Laboratories where the bidder intends to get type testes performed shall be indicated in the bid.

- 43.4.5 Bids shall accompany with Type test reports.**

**PLEASE NOTE THAT IF THERE ARE ANY CONTRADICTIONS IN CLAUSE REGARDING ANY TESTS EXISTING IN THIS VOLUME AND OTHER TECHNICAL VOLUMES OF THE SPECIFICATION THE ABOVE**

**CLAUSE SUPERCEDES THOSE IN OTHER TECHNICAL VOLUMES.**

**43.5 TEST REPORTS**

The Test Reports shall indicate clearly the standard values specified for each test, to facilitate checking of the test reports. These shall incorporate all tests carried out on all equipment and its components, as well as characteristic curves of the equipment, including reports on official tests, waves, failure, detention data and copies of final test oscillo-grams, as relevant in terms of the applicable technical specifications.

Reports of tests carried out on the equipment shall furnish the following information:

- i) Complete identification data including serial number.
- ii) Method of application and duration of tests and standards to which conforming.
- iii) A description of the test equipment with diagram showing arrangement of the test instruments and devices.
- iv) Sample computation, where necessary of desirable, to show the test values employed in the equations.
- v) Curves showing relation of tests quantities.
- vi) Data in tabulated form.
- vii) Comparison of the test results with the guarantee requirements of the specifications and explanation of deviations, if any.
- viii) Oscillograms, if any.

**43.6 Testing Facility** the Bidder shall state in the proposal, testing facilities available at his works. Should full capacity testing equipment be not available at his works, the Bidder shall state in his bid where he would arrange to get the full capacity tests carried out. For such of the characteristics for which he proposes to adopt any alternative to full capacity testing, he shall state in his bid the method proposed to be adopted giving detailed computations and full justifications for suitability of the method to reliably ascertain equipment characteristics corresponding to full capacity testing.