

भारत सरकार, रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS



TI/STR/005
(Revision-2)

SCHEDULE OF-TECHNICAL REQUIREMENTS FOR
MANUFACTURING & TESTING FACILITIES AND
QUALITY CONTROL REQUIREMENT
FOR
APPROVAL OF VENDOR (**FIRMS**)
FOR
SHUNT & SERIES CAPACITOR BANKS FOR TRACTION
SUB-STATIONS OF INDIAN RAILWAYS
AS PER RDSO SPECIFICATION NO.

1. TI/SPC/PSI/FC&SR/0100 (01/10) or Latest.
2. **TI/SPC/PSI/FC&SR/1210 or Latest**
3. ETI/PSI/75(10/97) or Latest.
4. ETI/PSI/127 (08/1989) with A&C Slip No. 1,2 &3 or Latest

ISSUED BY

TRACTION INSTALLATION DIRECTORATE,
RESEARCH DESIGNS & STANDARDS ORGANISATION,
MANAKNAGAR, LUCKNOW – 226 011.

	Prepared By	Checked by	Approved by
Signature			
Designation			

1.0 SCOPE

This schedule covers the technical requirement to assess the manufacturing capability of firms of capacitor unit for Shunt & Series Capacitor Banks for use in 25 kV, single phase & 2 X 25 kV AC traction system on Indian railways.

2.0 GENERAL INFRASTRUCTURE AND MANUFACTURING FACILITIES

2.1 The **firms** should have adequate covered accommodation for the purpose of effective storage of inward raw material and the finished product awaiting dispatch **after** prototype / routine inspection & testing. The **firms** should have an effective quality control system to monitor quality of the ;

- Inward raw material
- Stage inspection at various assembly/manufacturing stages.
- Inspection of the final assembled product to conform adherence to the requirements of the specification.

2.2 The **firms** should have a proper drawing office with AutoCAD **Centre** to support the designs/ development of product. The **firms** should have a clean, pollution free environment **and** taking adequate safety precautions during the production. The **firms** must have items like fire extinguishers, safety warning board, shock treatment charts and medical first aid kit in their premises.

2.2 The relations with the workers should be harmonious and regular employee training programs should be scheduled by the management for regular up-gradation of the knowledge and skills of the employees.

3.0 MACHINERY AND PLANT

The following machinery and plant of suitable capacity should be available at the firms' premises for the manufacturing of the capacitor units:

- 3.1 Automatic Capacitor film winding machine
- 3.2 Tag soldering machine
- 3.3 Drying ovens
- 3.4 Vacuum impregnation chamber (**set up**) along with capacitor dielectric oil processing plant
- 3.5 Oil filtration plant
- 3.6 Heating oil chamber, chilling plant along with cooling tower
- 3.7 Paper cutting machine
- 3.8 Tig welding machine
- 3.9 Fabrication tools, Insulation cutting and preparation machine, lathe, cutting, drilling machine.
- 3.10 Air compressor
- 3.11 Overhead crane
- 3.12 Humidity controller
- 3.13 Shot blasting machine/Vapor degreasing plant
- 3.14 Spray painting bench / and zinc spraying machine

- 3.15 DG set
- 3.16 Central air conditioning system.

NOTE: The activity at para 3.9, 3.13 & 3.14 above i.e., Fabrication tools, shot blasting machine/Vapor degreasing plant and Spray-painting bench / and zinc spraying machine may be outsourced subject to stringent quality control by **applicant firms**. The **firms** have to provide detail information regarding this in the Quality Assurance Plan (to be approved by RDSO) and also ensure that the Fabrication tools, shot blasting machine/Vapor degreasing plant and Spray-painting bench / and zinc spraying machine shall be essentially available at the premises of the firms from where this facility is outsourced.

4.0 QUALITY CONTROL REQUIREMENTS

- 4.1 The Vendor should possess valid ISO 9001 certificate for manufacture of same/similar item at his works address for which approval is being sought and it should be broadly covered in the scope of the certification for **design**, manufacture and supply.
- 4.2 Quality manual of the vendor for ISO- 9001 certificate should clearly indicate at any stage the control over manufacturing and testing of the product.
- 4.3 There should exist a system of easy traceability of the product from the raw-material stage to the finished product stage.
- 4.4 The firms should have a system of monitoring the supplied product complaints. The complaints made by the customer should be identifiable to the various manufacturing stages of the product and linking the complaint for corrective and preventive action of the product.
- 4.5 Quality assurance plan for the product in accordance with RDSO's guideline should be available. Quality assurance plan (QAP) shall be approved by RDSO.
- 4.6 There should exist a quality manual of the firms indicating the extent of control over production and testing.
- 4.7 An Engineering Degree/diploma holder must be the head of the inspection / testing / final control section with 5 years' experience in the relevant field.
- 4.8 There should exist a system of documentation in respect of rejection at the customer and its warranty replacement.
- 4.9 System should exist for documentation of the following.
 - Incoming raw material with Test Certificate (TC) reference of suppliers as well as internal test / audit checking from outside agency.
 - Details regarding stage inspection and test results.
 - Details regarding the final testing and dispatch to the customer in proper packed condition.
 - System for timely calibration of testing and measuring instruments.
- 5.0 The manufacturer shall have a dust level controlling system. The dust level control in the main capacitor bank winding room shall at no point exceed the following limits:
 - Particle size;

- i. More than 5 microns - 50 particles per cu.ft.
- ii. 5 microns to 1 micron - 150 particles per cu.ft.
- iii. Less than 1 micron - 200 particles per cu.ft.

6.0 INSPECTION AND TESTING FACILITIES

The firms should have the following testing and measuring instruments / equipments. These instruments should be calibrated with standard master instruments accountable to national Physical Laboratory or a similar reputed international/national agency. Each instrument should have a valid calibration certificate.

- 6.1 **Tan- δ & capacitance measuring instrument capable of displaying the values of Tan- δ & Capacitance (Latest equipment having built in null detector should be available and mentioned)**
- 6.2 **LCR meter**
- 6.3 Digital capacitance meter
- 6.4 Million mega ohm meter
- 6.5 DC & AC high voltage application test bench fitted with output meters with appropriate time measuring devices.
- 6.6 Discharge test set up
- 6.7 Oven for sealing test
- 6.8 Megger upto 5 kV
- 6.9 DC/AC Digital ammeter, voltmeter, wattmeter, phase angle measurement meter, timer & frequency meter
- 6.10 Temperature and humidity indicator
- 6.11 **Vernier Caliper & micro-meter**
