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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SCHEDULE of TECHNICAL REQUIREMENTS

for

MANUFACTURING/REPAIRING/REHABILITATION

of

SMOOTHING REACTOR(SL 30)

for

25 KV AC CONVENTIONAL ELECTRIC LOCOMOTIVES

Specification No. 4.TES.075.001 dt. 20.12.2006 or latest

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Electrical Directorate,
Research Designs & Standards Organisation
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SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE/REPAIRING/REHABILITATION OF SMOOTHING REACTOR (SL 30) FOR CONVENTIONAL ELECTRIC LOCOMOTIVES

1.0 SCOPE:

The Schedule of Technical Requirements (hereafter called STR) specifies the requirements to be met by vendors (hereafter called firm) who manufacture/repair/rehabilitate, test and supply of SL 30 for tap Changer electric locomotives. Smoothing Reactors type SL 30 are used on conventional AC locomotives with DC traction motors. Two Nos. of forced air cooled smoothing reactors are provided on locomotive (one for each block of Rectifier Unit feeding 3 Traction Motors of a bogie). Smoothing Reactors are procured by Pus/Railways conforming to CLW Specification No. 4TES.075.001(latest).This STR should be read in conjunction with the technical specification No 4.TES.075.001 dt. 20.12.2006 or latest for 25 KV AC conventional locomotives.

The firm should satisfy themselves having complied with the requirements of the specification and this STR.

2.0 QUALITY SYSTEM:

2.1 The firm should have **valid ISO 9001:2000 certification** covering the manufacturing and testing of the subject item.

2.2 The firm should possess a clearly laid down **Quality Assurance Plan** for the product covering the following aspects:-

(a) Organisation Chart, clearly indicating the quality control set-up.

(b) Qualification of key personnel and the officials deployed in quality control cell.

(c) Process Flow Chart indicating process of manufacture for an individual product or for a family of products, if the process is same.

(e) **Quality Assurance System** – Inspection and Testing Plan to cover:

- Incoming material
- Process control
- Product control
- System control
- Testing facility

(f) Stage inspection detailing inspection procedure, inspection parameters, method of testing / test procedure including sample sizes for destructive and non-destructive testing etc.

(g) Calibration Scheme and status of calibration of test equipment.

2.3 The firm should ensure that proper record of complaints received from users (Railways) is being maintained & corrective action is taken.

2.4 The firm should be in possession of **Digital Signature Certificate** from valid licensing authority in order to be able to interact with the E-procurement website and submit tenders electronically.

3.0 DOCUMENTS:

Following National/International standards(latest version) should be available in the firm's own documentation department for reference purposes.

(i) IEC – 60310
(ii) IEC: 60077-1, 60077-2
(iii) IEC:61287
(iii) IEC: 61373

4.0 RAW MATERIAL:

4.1 The supplier shall ensure that the purchased product/raw material conforms to the specified requirements and is procured from reputed suppliers only on the basis of well-prepared technical specification. Such technical specification shall be made available to the customer/RDSO as and when called for. Raw Material shall be purchased from reputed suppliers or RDSO/CLW approved sources if any.

4.2 Keeping in view to achieve a objective of quality-oriented material, a quality team of engineers shall be employed for preparation of the specification of raw material and scrutiny of incoming tender.

4.3 Proper test procedures shall be evolved and carried out on all the raw materials purchased by the firm. Such test results, documentary proof of purchase and test certificate of each component shall be maintained and produced to the consumer/RDSO/inspecting official as and when called for.

4.4 A record of each sub-supplier clearly showing the quantity purchased and rejected as well as cases of late delivery, if any shall be kept.

4.5 The firm shall maintain list of bought out items of assembly along with

- Basis of procurement i.e. specification / test programme etc. and assurance that the material is of standard quality.

- Tests carried out by the sub-vendors on bought out items and test certificate for each lot of supply.

- Tests carried out by the firm on the bought out items before permitting their assembly.

- Sources of procurement with details of their quality assurance plan of these sources.

4.6 The firm shall maintain :

- List of in-house manufactured items.

- Detailed drawings, jigs & fixtures required and process adopted for these items.

- Details of the process followed and routine checks observed for assembly of the items.

- Record of shelf life of items like varnish / epoxy resins / chemicals etc. used.

4.7 Testing should be done as per specification under competent technical staff of the firm and document to indicate its competence be maintained.

5.0 PROCESS OF MANUFACTURING/REPAIR/ REHABILITATION

5.1 Complete Process Flow Chart covering all steps of process of manufacturing/repair/rehabilitation for an individual product shall be clearly enlisted as a part of QAP.

5.2 Details of Jigs and fixtures used during manufacture/repair/rehabilitation should be furnished along with the manufacturing process wherever used.

5.3 The general assembly shall be as per OGA drawing and various parts shall be as per drawings / specification No. 4.TES.075.001 dt. 20.12.2006 or latest for the SL-30.

5.4 All the raw materials and finished product should be stored in a neat, clean and dust proof atmosphere.

5.5 The coil shall be formed from a single length of copper strip.

5.6 The minimum requirement of machinery and plants at the firm's works shall be as under:-

- Special tools for burr free punching of holes in the laminations.
- Edge winding machine (Automatic)
- Annealing plant
- Hydraulic Press
- Bending Machine
- Drilling Machine
- Lifting Crane preferably (EOT 10 Ton capacity)
- Pickling Plant for Cleaning of Copper Coil
- Jigs, Fixtures and Mandrils for Pressing
- Special jigs for winding the coil
- Special jigs / fixtures for assembly of the coils
- Drying oven
- Pellet Trolly with Hydraulic arrangements
- Stand for putting inter layer insulation
- Storage chamber for varnish and insulations at requisite temperature.
- Electro carbon brazing equipment
- Tinning bath with temperature monitor.
- Grinding machine

6.0 QUALITY ASSURANCE PROCESS- INSPECTION AND TESTING PLAN

6.1 Since magnitude of work may vary depending upon the extent of repair/rehabilitation of SL-30 and as per terms of individual contracts, the QAP should include process of joint recording of scope of jobs to be done on each of the units with Railways and the firm's representatives before the start of work.

6.2 Complete Inspection and testing Chart covering all steps of process of manufacture/repair/rehabilitation for an individual product including final inspection should be clearly enlisted as a part of QAP.

6.3 The following details of measuring instruments/equipments/jigs/fixtures used for all the steps of measurement operations should be included:

- Make and model of the measuring equipment & procurement/commissioning
- Accuracy
- Quantity to be measured and acceptable value range.

6.4 Stage inspection detailing inspection procedure, inspection parameters, and method of testing/test procedure including sample sizes for destructive and non-destructive testing. Record of test results of stage inspection should be available in prescribed ISO formats.

6.5 The minimum requirement of test facilities at the firm's premises for testing the equipment shall be as under :-

- Rectified DC Source of adequate capacity for Heat Run Test
- 1000 Hz., 25 Amps., 500 Volts source for High Frequency Test
- HV Tester (0 - 15 KV)
- Digital Ohm Meter
- Air Velocity Meter
- Multi Channel Temperature Indicator
- Air Duct with Blower for Heat Run Test
- Mono Meter
- Current Transformer 500 A / 5A
- LCR Meter
- 50 MHz. Oscilloscope
- Digital Frequency Meter 0-1000 Hz
- Digital Multimeter
- Megger 2.5 KV
- 200 A 3-phase variac for cooling blower
- High Voltage Impulse Tester
- Shunt 75 mw at 1500 Amps. DC
- AC Ammeter (0-15 Amps.)
- Stop watch
- Surge comparison tester
- Mercury thermometer (0-25 deg.C)

6.6 The capacity / accuracy of the testing and measuring instruments shall be adequate to meet the requirements of the specification.

6.7 All testing equipments should have valid calibration certificate from a Government approved laboratory.

7.0 Specification/Drawings:

Specification No. 4.TES.075.001 dt. 20.12.2006 (latest version) along with all other referred Drawings/SMIs/MS/ should be available in the firm's own documentation department for reference purposes.

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