STR No. RDSO/2007/EL/STR/0020, Rev. '0'

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SCHEDULE OF TECHNICAL REQUIREMENTS

for

MANUFACTURE AND TESTING

of

Thin walled Flexible Chemical Cross Linked Cables with Copper Conductors

for

working voltages upto 1.8 KV/3.0 KV

for

TAP CHANGER ELECTRIC LOCOMOTIVE/EMU

Specification No. ELRS/SPEC/ELC/0019, REV.0

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RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW - 226 011

Schedule of Technical Requirements for Manufacture and Testing of thin walled flexible Elastomeric Cables (with Chemical Curing Process)with copper conductors for working voltages up to 1.8 KV / 3.0 KV for tap Changer 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, test and supply of thin walled flexible Elastomeric Cables (with Chemical Curing Process) for electric locomotives. This STR should be read in conjunction with the technical specification No ELRS/Spec/ELC/0019, Rev 'O' with Amendment No1to4. The firm should satisfy themselves having complied with the requirements of the specification and this STR.

2.0 CREDENTIAL

The firm should have experience in manufacturing similar products (i.e,Thin walled flexible Cable (with Chemical Curing process) during last three years. The company profile and details of past orders of similar products should be furnished.

3.0 QUALITY SYSTEM

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

3.2 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.

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

3.4 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.

4.0 RAW MATERIAL:

4.1 Raw Material shall be purchased from reputed suppliers. Documentary proof of purchase and test certificate of each component shall be maintained and produced.

4.2 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.

5.0 MANUFACTURING

The firm should posses in-house all the machinery & plant and testing equipments as per Annexure-1 The machines should preferably be computerized numerically controlled (CNC) to ensure requisite accuracy. Appropriate meters and Gauges of requisite accuracy should be available.

6.0 TESTING

6.1 Testing machine set up should be available in the firm's own premises capable of accurate all the testing of cable as specified in the technical specification of the item.

6.2 The firm shall have a test laboratory having all facilities to carry out physical, electrical and chemical testing of raw materials and finishing products. The laboratory should be headed by a qualified technical personnel directly responsible for quality of testing.

6.3 The accuracy and capacity of the testing and measuring equipments shall be adequate to meet the requirements of the specification.

6.4 The testing and measuring equipment shall be duly calibrated and the validity of calibration should be verified by checking the calibration certificate issued by the calibration agency from where it was calibrated.

6.5 Meticulous record of testing for various stages (raw material / finished product) for each batch of production shall be maintained.

7.0 DRAWINGS

The firm should submit the manufacturing drawings of the subject item manufactured by them for RDSO's approval before manufacture. Notwithstanding any approval to drawings / designs by RDSO, the firm shall be solely responsible for performance of the product.

ANNEXURE-1

LIST OF MACHINERY & PLANTS (THIN WALLED CABLES)

1. Wire drawing machines with On-line annealing.
2. Tinning plant.
3. Bunching machines
4. Stranding machine with floating carriage.
5. Two roll mixing mill.
6. Rubber internal mixer (Banbury type).
7. PLCV/CCV line with dual head Extruder (Dry Cure).
8. On-line diameter controller (Sikora type or equivalent).
9. Printing/marking machine (ink jet type).
10. Over head cranes
11. Fork lifter/trucks
12. Stand by DG set.
13. A.C. Go-down – for storage of rubber and rubber chemicals

LIST OF EQUIPMENTS

1. Fourier transmission infra red spectrometer (FTIR) or equivalent – for polymer identification.
2. Monsanto Rheometer R-100 or equivalent – for measurement of curing characteristics of compound.
3. Tensile testing machine (Instron type or equivalent) – for measurement of mechanical properties and dynamic cut through of insulation and sheath material.
4. Tensile Testing machine – for measurement of mechanical properties of copper rod and fine wires.
5. Plasticorder (Bra bender or equivalent) -for development of compound.
6. Hot air Oven up to 250/300^{o}c – for accelerated ageing test.
7. Ozone resistance test equipment.
8. Moulding press.
9. Hot set test equipment (Closed type).
10. Oxygen index – measurement of fire resistance properties.
11. Smoke density chamber – for measurement of smoke generation.
12. Toxicity index test equipment – measurement of toxicity of combustion gases.
13. pH and conductivity test equipment.
14. Vertical flame test Apparatus – flammability test.
15. Abrasion resistance test equipment.
16. Pliability test equipment.
17. Air bomb test equipment – for air bomb ageing test.
18. Weather ability tester.
19. Deep freezer (Up to - 40^{o}c) – for measurement of cold bend and cold impact property.
20. 50 KVA 3 phase transformer – H.V. test.
21. Mega Ohm metre – Hawlett Packard.
22. B.D.V. tester
23. Spark tester.
24. Digital weighing machine.

OPTIONAL EQUIPMENT

1. Thermo Gravimetric Analyser (TGA) – for thermal behaviour of polymer and chemicals.
2. Differential Scanning Calorimeter (DSC) – for thermal behaviour of polymer and chemicals.
3 High performance liquid chromatography (HPLC) – for evaluation of rubber chemicals.