



सत्यमेव जयते

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

**TI/STR/006 (Rev-04 05)**  
(December, 2016 .....)

Schedule of Technical Requirements for Approval of Vendors for Supply of  
25kV Silicone Composite Insulators as per RDSO's Specification  
No. TI/SPC/OHE/INSCOM/1071, Rev-01  
(or latest)

Approved by	Signature

**ISSUED BY**

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

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## 1.0 SCOPE

This Schedule of Technical Requirement (STR) is to assess the manufacturing capability of the vendors for new registration/approval of Silicone Composite Insulators for 25 kV ac. 50 Hz electric traction. This schedule pertains to the manufacture of Composite Insulator by the jointing of metal fittings with FRP rod by crimping and consequently injection moulding of Silicone Rubber Compound over the FRP rod. This STR shall be read in conjunction with RDSO's Specification No. TI/SPC/OHE/INSCOM/1071, Rev-01 or latest.

~~1.1 Existing approved vendors shall comply this Schedule of Technical Requirement (STR) within six (6) months from the date of issue of this STR.~~

## 2.0 GENERAL INFRASTRUCTURE & MANUFACTURING FACILITIES

~~The manufacturer should have full fledged in-house testing facilities in India and indigenous manufacturers who have developed such in-house facilities shall be encouraged.~~

~~2.1 Beside he must have adequate covered accommodation for storing raw material, finished items awaiting dispatch and arranging inspection.~~

The manufacturer should have adequate covered accommodation for

2.1.1 storing of raw material,

2.1.2 Items awaiting for inspection, finished items awaiting for dispatch and arranging for inspection.

2.1.3 Separate space should be available for storing, inspection and issue of metal fittings.

2.2 The manufacturer should have system to ensure that the product conforms to the requirements of RDSO's Specification No. TI/SPC/OHE/INSCOM/1071, Rev-01 or latest.

## 2.3 MACHINERY AND PLANT.

Following machinery and plant of suitable capacity should be available for manufacturing the Composite Insulator.

SN.	Machinery & Plant
i	Equipment for Injection moulding of Silicone Rubber Compound over FRP rod with Temperature Control.
ii	Assembly jigs to align the metal fittings.
iii	Go & No Go Gauges for the overall length of the Insulator.
iv	Measuring equipment like vernier caliper, inside & outside caliper etc.
v	Crimping Machine of suitable capacity.
vi	Rheometer for determination of processing parameters of Silicone Rubber Compound.
vii	<del>Separate dust free</del> controlled area for cleaning of FRP Rod and application of primer with suitable cleaning facilities closer to the

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	place of Moulding
viii	Electric Oven with Temperature Control.

- 2.4** The manufacturer shall procure FRP rod from a reputed firm, according to the specification made by him **the manufacturer** suitable to the requirements of RDSO's specification. The manufacturer shall ensure the quality of the FRP rod supplied by his vendor.
- 2.5** The manufacturer shall procure the **vulcanizing** Silicone Rubber compound from a reputed firm ~~whose product shall meet~~ **as per** the requirement of the RDSO's specification & should furnish the product data **sheet during design submission to RDSO**. The manufacturer shall ensure the quality of Silicone Rubber Compound supplied by his vendor.
- 2.6** The manufacturer of Insulators is responsible for the quality and after sale service of the supplied Insulator. The manufacturer of Insulators shall attend to the complaints, immediately and implement remedial action over Indian Railways.

### 3.0 TESTING FACILITIES

The firm should have the following in-house testing facilities of suitable capacity in India.

SN.	Machinery & Plant
i	High voltage transformer set up as per requirements of the specification suitable for a. <b>Dry Power Frequency Voltage Test</b> b. <b>Dielectric Strength test</b>
ii	Equipment to conduct sudden load release test at -20°C to -25°. <ul style="list-style-type: none"> <li>a) Arrangements shown in Fig B-1 of IEC: 61109 may be adopted with suitable device for test to be conducted at -20° C to - 25° C.</li> <li>b) The equipment for Thermal mechanical test may be suitably modified and used.</li> </ul>
iii	Equipment for Thermal mechanical test.
iv	UTM machine with facility for conducting tensile and bending test or Separate machine with facility for conducting tensile load test and bending test <b>can also be provided</b> . These should be equipped with PLC controlled interface.
v	Test set up for test on control of the slope of the strength - time curve of the insulator.
vi	Test set up for inclined plane tracking and erosion test as per IEC: 60587.
vii	Test set up for water immersion test.
viii	Test set up for dye penetration test of the core material (FRP rod).
ix	Test set up for water diffusion test of core material (FRP rod) in line with Figure 2.3 and 4 of IEC: 61109.
x	Test set up for water absorption test of FRP rod.
xi	Test set up to conduct galvanization test on the metal fittings.

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xii	Tensile testing machine for testing of tensile strength and elongation of Silicone Rubber compound.
xiii	Facility for conducting Tear Strength.
xiv	Test equipment for measurement of Hardness (Shore A & Barcol).
xv	Test equipment for conducting tests for (a) DC Volume resistivity (b) Dielectric strength
xvi	Facility for conducting test for specific gravity.
xvii	Test equipment for testing resistance to weathering & UV as per ASTM G 53 154.
xviii	Facility for conducting glass content test on FRP rod.
xix	Facility and arrangement for conducting "Brittle fracture resistance test".
xx	NDT Testing (i.e. ultrasonic, Radiography etc) equipment to test the bonding of rubber.
xxi	Test set up for testing of Eccentric Loading Test (for Sectioning Insulator manufacturer).
xxii	Test set up for Torsion Test (for Post Insulator manufacturer).

### 3.1 OTHER REQUIREMENTS & TESTING FACILITIES:

- i. The manufacturer should have manufactured and supplied Insulators of voltage rating of 25 kV or above to different utilities.
- ii. The manufacturer should have in-house facility for designing dedicated design office of the Insulator with adequate R & D facility for designing of composite insulator.
- iii. The design office should be equipped with Design software e.g. Auto CAD or any other suitable 2D or 3D modeling software along with suitable printer/potter etc. Manufacturer should also have Electric Field modeling software e.g. Electron-2D or any other suitable software to validate design of insulator (alternatively firm may outsource Electric Field modeling to NABL/NABCB lab/ suitable agency).
- iv. Firm should have at least one Engineering Graduate with experience of more than 5 years in the field of Polymer/Rubber/Chemical Engineering.
- ~~v. Manufacturer should have Design software e.g. Auto CAD or any other suitable 2D or 3D modeling along with suitable printer/potter etc. Manufacturer should also have Electric Field modeling software e.g. Electron-2D or any other suitable software to validate design of insulator (alternatively firm may outsource Electric Field modeling to NABL/NABCB lab/agency).~~

### 4.0 QUALITY CONTROL REQUIREMENTS.

- ~~4.1~~ The firm should have acquired ISO 9001: 2015 series certification for the

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product for which an approval is sought and the product should be broadly covered in the scope of the certification for manufacture and supply (~~the current ISO 9001:2008 standard will remain valid during transition period i.e. till Sept-2018~~).

**4.2** Quality manual of the firm for ISO 9001: 2015 should clearly indicate at any stage the control over manufacturing and testing of the said product (~~the current ISO 9001:2008 standard will remain valid during transition period i.e. till Sept-2018~~).

**4.3** ~~The~~ There exists a system of easy traceability of the product item at supply by vendor stage and finished product stage. A system of easy traceability of the product from raw material stage to finished product stage should be available.

**4.4** a. ~~Quality Assurance Plan (QAP) should be prepared as per RDSO's guideline and approved by RDSO.~~

~~b. The Firm should have an approved copy of the QAP for implementation.~~

The Quality Assurance Plan (QAP) of the product prepared as per RDSO ISO guidelines should be available.

**4.5** The assembly of the insulator shall be done by well trained staff under the Supervision of qualified staff with experience in the field.

**4.6** ~~Quality manual of the firm indicating the extent of control over production and testing should be available.~~

**4.7** System should exist for documentation of the following:

- a. Incoming raw material with Test Certificate (TC) reference of supplier as well as internal test and audit checking from outside agency & product data sheet, wherever required.
- b. Ensure that details regarding the test results of various stages in production and routine testing are available.
- c. Ensure that a system exists for calibration of testing & measuring equipment and record is maintained.

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