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SCHEDULE OF TECHNICAL REQUIREMENTS FOR PREPARATION OF READYMADE CABLE HARNESS

S. No.	Details of Amendments	Revision	Page No.	Reasons of Amendment
1	STR REVISED	C	-	Updated

Approved by

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SCHEDULE OF TECHNICAL REQUIRMENTS FOR PREPARATION OF READYMADE CABLE HARNESS

1.0 Forward:

This Schedule of Technical Requirements (STR) specify minimum essential Machinery, Plant and Testing Equipments required for **Preparation of various types of Readymade Cable Harnesses** for RCF built coaches and shall also be read in conjunction with the relevant Standards/Drawings/Specifications.

1.1 The firm should satisfy himself about having complied with the technical requirements of the Standards/Specification and other Infrastructure, Testing Facilities requirement as per STR before applying for registration/assessment as per relevant STR.

1.2 The firm should have currently valid **ISO-9001** Certification including the subject item under its range of manufacture.

1.3 Firm is advised to regularly visit RCF website and get themselves updated on changes being made from time to time in STR/Specifications/Drawings.

1.4 Every Item shall be numbered /marked for identification traceability and analysis. The following details shall be imprinted on the number plate of each unit.

a) Serial Number
b) Year and month of manufacture, P.O. reference
c) Name of the item
d) Name of firm

2.0 FACILITIES:

STR for **Preparation of Readymade Cable Harness** for RCF built coaches contains following Annexure's:-

2.1 ANNEXURE-I:

It contains essential M&P infrastructure required for preparation of **Readymade Cable Harness**. It however does not specify the capacity and quantity of the various items of equipment/components, the Quantity/Capacity of the M&P being dependent upon the manufacturing requirement. The firm should also have the facility for storing the Raw Material and Finished Product so as to maintain them in a healthy condition.

2.2 ANNEXURE-II :

It contains all Testing Facilities required. Record of calibration of all measuring apparatus shall be maintained and made available on demand.

2.3 ANNEXURE-III :

It contains Quality Assurance Plan (**QAP**) for implementation by the firm. It will also be pre-requisite for a firm to submit QAP for according approval for preparation and supply of Readymade Cable Harness. The major points, which are essentially required to be covered, shall be included therein.

2.4 ANNEXURE-IV

It contains the requirements to be fulfilled for establishing the credentials or the service network so that reliability of the equipment is ensured.

2.1: ANNEXURE-I

DETAILS OF ESSENTIAL INFRASTRUCTURE

The following Essential facility / Machinery & Plant Infrastructure required necessary for Preparation of Readymade Cable Harness of quality and reliable product:

1. Cable Stacking/Handling Table.
2. Cable Stripper.
3. Cutting Machine of adequate Capacity (for PVC Conduit etc.).
4. Battery /Hydraulic Operated Automatic Crimping Tool for Size of Cables up-to 185 sq.mm.
5. Adequate Floor Space. (Appox.=**30mt.x15mtr** (min.))
6. Dust Free Room for making Crimping.
7. Harness Table with complete Measurement and marking system.
8. Enclosed Storage Space for Ready Material.
9. Display Boards for Harness Table.
10. Compressor for Air Supply.
11. Working tables of suitable sizes/adequate length.
12. Small Working Tools.
13. Cable cutting and dressing tools.
14. Computer/Printer for Cable Markers of approved makes.
15. Trolley for carrying material with in Workshop.
16. Record Keeping for Incoming Material and Dispatch of Finished Product.

Note: ALL THE ABOVE FACILITIES ARE CONSIDERED "**ESSENTIAL**" AT THE DEVELOPMENTAL STAGE AND SHALL BE VERIFIED BY RCF BEFORE CONSIDERING THE FIRM AS A DEVELOPMENTAL SOURCE.

2.2: ANNEXURE-II

ESSENTIAL MEASURING INSTRUMENTS FOR TESTING

The following **Instruments** are considered Necessary/Essential for Testing purpose:-

1. HV Tester. (0-6KV range)
2. Megger. (500V/1000V DC)
3. Continuity Tester. (10 point with expandable ports)
4. Regulated DC Source. (0-200VDC)
5. Pull out Testing Jigs with Suitable Adaptors for various sizes. (PG-11 to PG-70 end fittings)
6. Digital Multi-meter.
7. Kelvin Double Bridge.
8. Vernier Caliper 0-150 mm.
9. Micro-Meter.
10. Flexing Tester as per IEC-61386.
11. Impact Tester as per IEC-61386.
12. Fire Retardant Test Chamber with Bunsen Burner. (with 9.0 mm dia nozzle)
13. Milli-volt Tester.
14. Deep freezer with range -5°C to +20°C.
15. Hot Air/Ageing Oven.
16. Tensile Tester. (1000 N)
17. Compression Tester. (1000N)
18. Water Bath. (min. 300x600x300 mm)
19. Steel Pipes of Suitable Sizes for Windability Test.
20. Measuring Tape.
21. Timer Stop Watch.
22. **Following Tests Facilities for testing of e-Beam Cables, PVC Conduits and Crimping Sockets are essentially required:**

    (a). e-Beam Cable: (Ref. Spec. ELRS/SPEC/ELC/0019 (latest)

    - **Test facility for measurement of Tracking Resistance.**
    - Complete Setup for Testing of Windability Test and Slippage Test on e-Beam Cables.

(b). PVC Conduits: (Ref. IS: 9537-Part-3)

- Test Setup for Collapse Tests for PVC Conduits.
- Test Setup for Bending Tests for PVC Conduits.

(c). Crimping Sockets. :-

(Ref. Spec. EDTS200 & EDTS201 latest)

- Flattening Test.
- Test Apparatus for Crimping Sockets for Pull Out Test.

NOTE: 1.). All the above facilities are considered **ESSENTIAL** at the developmental stage and shall be verified by RCF representative before considering the firm as a developmental source.

2.3: ANNEXURE-III

QUALITY ASSURANCE PLAN (QAP)

The QAP shall be got approved from RCF and proper record shall be maintained.

1. Organization:-

The firm shall submit the organizational chart along with the qualification and experience of key persons in management involved in Quality Assurance Programme. Being a manpower intensive job the following technical staff must be employed during developmental stage:

- ITI with min. **02** years experience or non ITI with min. **05** years experience.
- Supervisors staff with min. graduate in Electrical Engg. with 02 years experience or diploma holder in Electrical discipline with min. 05 years experience.

2. Documentation:-

The manufacturer shall maintain all necessary documents and data that will help him to have consistency in producing quality product.

3. Purchase of Raw Material:-

Raw Material shall be procured from **RCF/ICF/MCF/RDSO Approved/Development Sources ONLY** conforming to the relevant Standards/Specifications/Drawings. The critical components shall be procured from ISO-9001 certified vendors only.

4. Quality Control Process:-

Screening of critical components shall be carried out In Process Inspection as a Quality Control Measure.

5. Inspection and Testing:-

(i) Receiving Material: The manufacturer shall ensure that incoming material is not used for processing until it has been inspected or otherwise verified as conforming to the specified requirements. Verification shall be in accordance with Quality Plan or laid down Documented Procedures.

(ii) **In Process Inspection and Testing**: Inspect, Test and Identify Product as required by the Quality Assurance Plan or Documented Procedures evolved on the basis of RCF Specification (the latest) and other relevant Specification/Standards.

(iii) The supplier shall carryout all final tests and inspection in accordance with the quality plan or documented procedures evolved on the basis of RCF specification and specified standard to complete the evidence of conformance of the Finished Product.

6. Testing /Measuring Instruments:

The instrument and equipment used for testing and inspection shall be of the required accuracy and shall have valid **calibration certificate from Govt./NABL certified lab**. The Calibration Record should be maintained and shall be produced at the time of inspection & shall be included in QAP document/test reports.

7. R&D Organization:

The firm shall indicate the organizational structure of their R&D wing along with qualification of the personnel. Firm should have at least one Engineering Graduate, R&D Engineer with experience of more than 05(five) years in the field of Electrical/Mechanical/Chemical/Polymer Engineering.

8. Laboratory Test House:-

The manufacturer shall have adequate Testing Facilities to carry out various tests on the Raw Material, Stage Inspection and inspection of the Finished Product.

9. Quality Audit:

The manufacturer shall regularly send the sample for testing in recognized National Testing Institutions/NABL Approved Labs for counter checking the characteristics and to ensure quality level of their product.

10. Handling/Storage/Delivery:

The manufacturer shall have proper and adequate facilities for Handling & Storage of Raw Material and Finished Product. The supplier shall control, packing presentation including compliance of FIFO (First In First Out) and marking process so as to ensure conformity to the Railway requirements.

2.4 ANNEXURE-IV:

REQUIREMENTS FOR ESTABLISHING THE CREDENTIAL

It contains the requirement to be fulfilled for stabilizing the Credentials so that Reliability of the Product/ Equipment is ensured.

1. The firm should have capability to attend failures at RCF and at Zonal Railways/Field Units of each Region widely spread across the Country with positioning of Qualified, experienced team of Engineers with minimum of 05 years experience in Electrical Engineering should be available so that they can investigate/attend the reported failures within the specified time limits as **"IS ON WHERE BASIS"** in the Zonal Railways/Depots/Field Units.