

**Schedule of Technical Requirements for Manufacture and
Supply of Set of Harnessed Cable Looms for Three Phase
Electric Locomotives as per Specification No.-
CLW/ES/03/0646**

ISSUED BY


Dy.Chief Electrical Engineer/D-I


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Approved By	Signature
CEE	 27/3/17

Recommended By	Signature
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SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF FOLLOWING FOR THREE PHASE LOCOMOTIVES:-

1.0 NAME OF EQUIPMENT

Set of Harnessed Cable looms for three phase electric locomotives

2.0 APPLICATION

Used in Three Phase Electric Locomotives in Indian Railways. The equipments are to be manufactured as per relevant drawings and specifications.




3.0 SCOPE

The Schedule of Technical Requirements (STR) is issued to serve as a guide to manufactures (called the "firm" hereafter) and should be read in conjunction with the relevant drawings and specifications with latest Revisions / Alterations. The technical requirements are meant to serve as guidelines only and are not exhaustive. The firm should satisfy themselves having complied with the requirements of drawings and STR. List of relevant Drawings / Specifications is listed as Annexure – I

Wherever lacking, existing CLW approved sources must also upgrade their facilities to fulfill the requirements of this STR within a period of One year from date of issue of this STR.

4.0 GENERAL REQUIREMENTS

- 4.1 The firm should have currently valid ISO-9000 certification issued by an approved agency of the International Accreditation Forum (IAF) with the activity desired clearly mentioned in the scope of certification.
- 4.2 A system of regular submission of rejection details of material giving rejection rate, cause of rejection, corrective action taken etc. on quarterly basis should be followed by firm.
- 4.3 The firm must have system of documentation in respect of rejection at customer end, warranty replacement and failure of item supplied by them during service.

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- 4.4 The firm shall have all latest relevant Standards like IS,DIN,BS etc. pertaining to product specification.
- 4.5 The firm shall have system of recording the plant, machinery and control equipments remaining out of service, nature of repairs done etc.
- 4.6 The testing & measuring equipments shall be duly calibrated and the validity of calibration should be current and verified by physically checking the calibration certificate issued by Calibration Agency from whom it was calibrated. Calibration shall be done by NABL accredited labs whose accreditation is valid on the date of calibration.
- 4.7 Firm should have adequate trained personnel and service after sales network.
- 4.8 Whenever there is any change with respect to approved QAP, the same shall be promptly submitted to CLW for approval.

5.0 QUALITY ASSURANCE PLAN (QAP)

The firm shall prepare a Quality Assurance Plan (QAP) before approval is sought and submit the same as part of compliance of this STR. The QAP shall be a comprehensive document covering the following aspects.

- i) Details of Quality Control Organization of the firm along with key personnel engaged in the QC function.
- ii) Qualification log sheet of the personnel manning the quality control set up.
- iii) Process flow chart indicating process of manufacture of an individual product or for a family of products for which the process is same.
- iv) Details of Sub-Vendors:
 - The name of item for which sub-vendor is approved.
 - The name of approving agency
 - Quality manual submitted by sub-vendor to primary vendor

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- The sub-vendor to have all the requisite infrastructure of manufacturing and testing facilities, preferably under one roof. The sub-vendor to broadly meet with all the technical requirements laid down in this STR.
 - The primary vendor is following periodical inspection schedule for sub-vendor strictly.
 - ISO Certification details of sub-vendor also.
 - The sub-vendor is also liable for assessment by CLW.
- v) Inspection and testing plan of
- a) Incoming Material as per format in Annexure – IV clause – 2
 - b) Process (stage inspection) as per format in Annexure – IV, Clause – 3
 - c) Product (Final inspection) as per format in Annexure – IV, clause – 5
- vi) All the formats used for recording inspection results.
- vii) System of traceability, traceability diagram linking traceability from raw material stage to internal check and finally lot offered for inspection
- viii) All internal checks to be carried out during manufacturing shall be summarized and furnished. List of documents to be maintained for these internal checks; that need to be signed by inspecting official before issue of Inspection Certificate shall also be furnished.
- ix) QAP Format

QAP must be submitted in the form of single document indicating name of the firm and page no. 'x' of 'y' on each page. Each page should be signed by Quality Control in-charge. The approved QAP must be a controlled document and a quality record of ISO 9001:2000 quality control system of the firm. A certificate to this effect shall be provided along with the QAP by the firm. The QAP shall be submitted in duplicate.

Details of the above aspect are described in the following paragraphs. The QAP shall be approved by CLW and shall form basis of approval process.

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5.1 QUALITY CONTROL ORGANISATION

- 5.1.1 The complete organizational setup of the Quality Control Key personnel and official along with their qualification and experience should be furnished.
- 5.1.2 The Quality Control Organization should be headed by a senior level official having degree in engineering who shall directly report to plant in charge.

5.2 INCOMING MATERIAL

- 5.2.1 A complete bill of material indicating all input material items required for manufacturing of the products, governing specification and their sources of supplies as approved by the firm should be furnished.
- 5.2.2 Raw material shall be procured from CLW/RDSO approved sources wherever applicable or from reputed suppliers if no CLW/RDSO source is specified. Documentary proof of purchase and test certificate of each component shall be maintained and produced.
- 5.2.3 Record of each sub-supplier clearly showing the quantity purchased and rejected as well as cases of late delivery, if any shall be kept
- 5.2.4 Incoming raw material shall be 100% inspected by Quality Control Department of the firm for any defect and deviation. The test results of incoming raw material with references to test certificate issued by the supplier and the results of internal tests carried out by the firm for verification may be submitted as part of QAP.

5.3 PROCESS OF MANUFACTURE

- 5.3.1 Complete process flow chart covering all steps of process of manufacture for an individual product(or for a family of product if the process is same),including the process flow of outsourced activities along with its integration with main process, shall be clearly enlisted as part of QAP.

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5.3.2 The following details of machine used for all the steps of machining operations should be included.

- Make, model and commissioning date of the machine.
- Accuracy.
- Details of machining operations.

5.3.3 Machining process should be such that all critical dimensions are final. Vague language like available or will install is not acceptable.

5.3.4 Details of jigs and fixtures used during manufacture should be furnished along with the manufacturing process wherever used.

5.3.5 List of typical Machinery & Plant, testing and measuring instruments required for manufacture is mentioned in Annexure – II. The list is for general guidance only and manufacturing operation shall be submitted and got approved by the firm as a part of QAP.

5.3.6 In case any structural work is involved, the welders shall be qualified in accordance with AWS Structural Welding Code D.1.1 or IS 817 with radiographic test. They should have undergone refresher course from reputed agencies as per IS: 817 & IS: 7310 and proper record should be maintained.

5.4 INSPECTION AND TESTING PLAN

5.4.1 Testing setup should be available in the firm's own premises capable of testing the equipments as specified in the relevant technical specification.

5.4.2 Complete Inspection and Testing Chart covering all steps of process of manufacture for an individual product including final inspection should be clearly enlisted as part of QAP.

5.4.3 The following details of Testing / measuring instruments / equipments / tools / jigs / fixtures used for all the steps of measurement and testing operations should be included:

- Make and Model of the equipment
- Name of the manufacturer

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- Accuracy
- Capacity or Range
- Date of Calibration
- Due date of calibration
- Agency of Calibration

Vague language like available or will install is not acceptable.

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

5.4.5 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 and furnished.

5.4.6 List of typical Testing and measuring instruments required for manufacture is mentioned in Annexure – III. The list is for general guidance only. However, the specific Testing & measuring instruments, gauges used by the firm will also form part of QAP and shall be submitted.

5.5 FORMAT TO BE SUBMITTED WITH QAP

Format to be submitted with QAP is enclosed as Annexure – IV. Firms shall fill these formats keeping in view Para 5.0

6.0 REQUIREMENTS FOR FOUNDRY FACILITIES

Wherever required, it is preferable if the firm has its own RDSO Class 'A' approved captive foundry. In cases where the firms do not have their RDSO Class 'A' approved captive foundry, they should fulfill the following conditions:

- Firm should use castings from RDSO Class 'A' approved foundry
- Firm should furnish undertaking from casting manufacturer showing long term commitment to supply castings to the firm.

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7.0 REQUIREMENTS OF ELECTRICAL AND ELECTRONICS LAB

Wherever applicable, Firms shall have electrical and electronics labs which should have Dust free, clean and non - humid environment preferably air conditioned. The lab shall have minimum following equipments in addition to equipments mentioned at Annexure – III:

- Digital Ammeter & Voltmeter suitable for Product
- L, C, R Meter
- Continuity Tester
- Meggar 1/2.5 KV
- Vernier Caliper & Micrometer
- Oscilloscope
- Variable Voltage Source 0 – 500/1000/2500 V AC/DC
- Variable Current Source both AC & DC
- Variable mA Source suitable for Product
- High Voltage Test kit – 5KV
- Digital Temperature Indicator 0 – 600°C

8.0 STORAGE FACILITY

- Adequate Dust free, clean and non - humid environment for storage of raw material and finished product separately
- Adequate Dust free, clean and non-humid environment for product assembly area
- Adequate Stacking / Handling tables and racks in above storage area.

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ANNEXURE - I

LIST OF DRAWINGS, SPECIFICATIONS AND STANDARDS

1. Specification No CLW/ES/03/0646

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ANNEXURE – II

LIST OF MACHINERY AND PLANT

Sl. No.	Name of Machinery & Plant	Capacity / Rating	Essential/ Optional **
1.	Adequate dust free storage space for storage of raw material	Minimum 5000 sq.ft.	Essential
2.	Dust free room for preparation of cable harness.	Minimum size 15m x 26m	Essential
3.	Adequate dust free storage space for storage of ready material	Minimum 5000 sq.ft.	Essential
4.	Adequate Cable stacking/handling tables and racks in above mentioned storage and working areas	---	Essential
5.	Standard cable cutting tools/machines	Cable size upto 300 mm ²	Essential
6.	Standard cable stripping tools/machines	Cable size upto 300 mm ²	Essential
7.	Harness tables/Jigs with complete measurement and marking	---	Essential
8.	EIT/ Sleeve cutting machines	---	Essential
9.	Hydraulic/Electric/Pneumatic crimping tools for connectors and Lugs.	Cable size upto 300sqmm	Essential
10.	Hydraulic/Electric/Hand crimping tools for control cables	standard	Essential
11.	Hydraulic/Electric/Hand crimping tools for screen cables	standard	Essential
12.	Insertion/removal tools	As per OEM's Requirement	Essential
13.	Temperature controlled hot air gun preferably digital type	---	Essential
14.	Compressed air supply arrangement	---	Essential
15.	Sleeve/ Cable Printer	---	Optional

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ANNEXURE – III

LIST OF MEASURING AND TESTING EQUIPMENTS

Sl. No.	Name of Measuring & Testing	Capacity/Rating	Essential/ Optional **
1.	HV Tester	Standard	Essential
2.	Software controlled Harness Tester	Should perform open test, short test, HV test and IR test of complete harness and have capability to save and print all test reports	Essential
3.	Megger	500/1000VDC	Essential
4.	Continuity tester	---	Essential
5.	Regulated DC source	0-200VDC	Essential
6.	Milli-volt tester	---	Essential
7.	Vernier caliper	---	Essential
8.	Screw gauge	---	Essential
9.	Micrometer	---	Essential
10.	Tensile testing machine	Minimum 27 kN	Essential
11.	Micrograph Machine	Standard	Optional
12.	Crimp height and crimp width measuring system	Standard	Optional

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ANNEXURE - IV

FORMATS TO BE SUBMITTED WITH QAP

1. Organization specific to the product

Description	Name of person with contact no.	Qualification	Experience	
			Field	Year
(a)	(b)	(c)	(d)	(f)
Design in – charge				
Production in – charge				
Quality Inspection in-charge				

2. Incoming Material Control

Subject/ Product/ Process	Sample size & its frequency of Inspection	Parameter for inspection	Mode of Inspection / Equipments used	Acceptance Limit/criteria/specified value as per Drg/Spec.
(a)	(b)	(c)	(d)	(e)

Document Reference	Record Format No.	Action in case of rejection
(f)	(g)	(h)

3. Process Control

(i) Proposed M&P

Sl. No.	Process/ Activity	Work Instruction Ref.	Machine Details					In- house / Out source
			Lead parameter	Make	Model	Comm. Dt.	Accuracy	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

(ii) Proposed Jig & Fixture

Sl. No.	Process/ Activity	Work Ref.	Instruction	Jig & Fixture Drg. Ref	In-house/ outsource
(a)	(b)	(c)	(c)	(d)	(e)

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4. Stage Inspection / Test Plan

Subject/ Process	Product/ Process	Instrument/ Jig & Fixture test bench used	Inspection Stage	Parameter for inspection	Sample size & its frequency of Inspection	Document Reference
(a)		(b)	(c)	(d)	(e)	(f)

Acceptance Limit/criteria/specified value as per Drg./Spec.	Inspection Agency	Record Format No.	Action in case of rejection
(g)	(h)	(i)	(j)

5. Product Control

Subject/ Process	Product/ Process	Instrument/ Jig & Fixture test bench used	Parameter for inspection	Sample size & its frequency of Inspection	Document Reference	Acceptance Limit/criteria/sp ecified value as per Drg./Spec.
(a)		(b)	(c)	(d)	(e)	(f)

Inspection Agency	Record Format No.	Action in case of rejection
(g)	(h)	(i)

6. Calibration Plan

Instrument Description	Serial No.	Make	Model	Year of procurement	Capacity / Range	Accuracy	Periodicity of Calibration
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)

Calibration Agency	Record Format No.
(i)	(j)

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7. Approved Sources for Raw Materials / Consumables

Raw Material / Consumable	Specification / Standard	Source with Address	Whether Source is controlled by CLW/ RDSO/Others
(a)	(b)	(c)	(d)

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