



NOTE:- 1. ALL DIMENSIONS ARE IN mm.

2. ~~ONE SAMPLE SHOULD GOT APPROVED BY THE CONSIGNEE BEFORE SUPPLYING THE BULK QUANTITY.~~

3. MATERIAL & TECHNICAL SPECIFICATION:- THE CABLE TERMINALS SHALL BE MADE OUT OF SEAMLESS HIGH CONDUCTIVITY COPPER TUBES WITH A MINIMUM COPPER CONTENT (ANY SILVER PRESENT TO BE COUNTED AS COPPER) OF 99.90% ELECTRICAL CONDUCTIVITY OF THE ANNEALED COPPER TUBES SHALL NOT BE LESS THAN 99.25% WHEN EXPRESSED AS A PERCENTAGE OF THE STANDARD VALUE FOR A STANDARD ANNEALED COPPER OF 100% CONDUCTIVITY, AS LAID DOWN BY IEC. THE CHEMICAL COMPOSITION OF THE COPPER TUBE SHALL CONFORM TO GRADE ETP OF IS:191 OF 1980/BS-1977 OF 1976.

4. STANDARDS:- THE RAW MATERIAL USED FOR THE TERMINALS SHALL CONFORM TO BS-1977 OF 1976; SPECIFICATION FOR SEAMLESS HIGH CONDUCTIVITY COPPER TUBE FOR ELECTRICAL PURPOSES, AND IS:191 OF 1980; SPECIFICATION FOR ELECTROLYTIC COPPER AND 15:1897 SPECIFICATION FOR COPPER STRIP FOR ELECTRICAL PURPOSES.

5. THE MANUFACTURER SHALL ENGRAVE/EMBOS/IMPRINT OR ANY OTHER PERMANENT IDENTIFICATION MARKS AS CONSIDERED SATISFACTORY INDICATING THEIR NAME, MONOGRAM AND BRAND NAME. TYPE NUMBER OF THE TERMINAL SHALL ALSO BE SUITABLY MARKED.

SOUTH CENTRAL RAILWAY बिद्युत योको शेंड ELECTRIC LOCO SHED मीनापुस्ट LALLAGUDA		N.D. Sengupta SSE/EG 06.02.2016 DATE		APPROVED 9/10/2016 Sr. DEE/ELS/LGD	
REF: AS PER SAMPLE		N.T.S. SCALE		NOTE: 2 DELETED. DRG.NO: C/ELS/LGD/CABL/4/05	
70sq mm SPECIAL TERMINAL FOR EARTH BRUSH OF 3 PHASE ELEC. LOCOMOTIVES					

Page 1 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
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**SCHEDULE OF TECHNICAL REQUIREMENTS FOR
MANUFACTURE AND SUPPLY OF EARTH RETURN BRUSH
WITH BRUSH HOLDER ASSEMBLY
FOR THREE PHASE ELECTRIC LOCOMOTIVES AS PER
SPECIFICATION NO. CLW/ES/3/0017**

ISSUED BY

**CHITTARANJAN LOCOMOTIVE WORKS
CHITTARANJAN – 713331
WEST BENGAL**

Approved By	Signature
PCEE	

Recommended By	Signature
CEE/D&D	

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Page 2 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF EARTH RETURN BRUSH WITH BRUSH HOLDER ASSEMBLY FOR THREE PHASE ELECTRIC LOCOMOTIVES:

1.0 NAME OF EQUIPMENT: EARTH RETURN BRUSH WITH BRUSH HOLDER ASSEMBLY.

2.0 APPLICATION:

Used in Three Phase (WAG9H / WAG9 / WAP7 / WAP5) Electric Locomotives in Indian Railways. The equipments are to be manufactured as per relevant drawings and specifications.

3.0 SCOPE:

This schedule of Technical Requirements (STR) is issued to stipulate the qualifying criteria of manufacturers for designing and manufacturing of Earth Return Brush with Brush Holder Assembly for three phase Electric locomotives to Indian Railways. The Schedule of Technical Requirements (STR) is issued to serve as a guide to manufacturers (called the "firm" here after) 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/IEC/IS/BIS/ASTM/DIN/EN is listed as **Annexure – I**

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

4.0 TERMINOLOGY/ABBREVIATIONS:

Abbreviations	Full form/Description
ASE	Automotive Service Excellence
BS	British Standards
CLW	Chittaranjan Locomotive works, Chittaranjan
DIN	Deutsches Institut für Normung
BLW	Banaras Locomotive Works
IS	Indian Standards
IEC	International Electro Technical Commission
ISO	International Standards Organization

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Page 3 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

NABL	National Accreditation Board for Testing and Calibration Laboratories
RDSO	Research Designs & Standards Organization
VDE	VerbandDeutscher Elektrotechniker
IP	Ingress Protection

5.0 GENERAL REQUIREMENTS

- 5.1 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.
- 5.2 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.
- 5.3 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.
- 5.4 The firm shall have all latest relevant Standards like IS, DIN, BS etc. pertaining to product specification
- 5.5 The firm shall have system of recording the plant, machinery and control equipments remaining out of service, nature of repairs done etc.
- 5.6 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.
- 5.7 Firm should have adequate trained personnel and service after sales network.
- 5.8 Whenever there is any change with respect to approved QAP, the same shall be promptly submitted to CLW for approval.

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Page 4 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

6.0 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.
 - 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

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Page 5 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

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.

6.1 QUALITY CONTROL ORGANISATION

6.1.1 The complete organizational setup of the Quality Control Key personnel and official along with their qualification and experience should be furnished.

6.1.2 The Quality Control Organization should be headed by a senior level official having degree in engineering who shall directly report to plant in charge.

6.2 INCOMING MATERIAL

6.2.1 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.

6.2.2 Raw material shall be procured from CLW/BLW/RDSO approved sources wherever applicable or from reputed suppliers if no CLW/BLW/RDSO source is specified. Documentary proof of purchase and test certificate of each component shall be maintained and produced.

6.2.3 Record of each sub-supplier clearly showing the quantity purchased and rejected as well as cases of late delivery, if any shall be kept

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Page 6 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

6.2.4 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.

6.3 PROCESS OF MANUFACTURE

6.3.1 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.

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

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

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

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

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

6.3.6 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.

Prepared By SSE/Design	Checked By AEE/Design	Issued By Dy.CEE/D-II
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Page 7 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

6.4 INSPECTION AND TESTING PLAN

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

6.4.2 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.

6.4.3 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
- Accuracy
- Capacity or Range
- Date of Calibration
- Due date of calibration
- Agency of Calibration

Vague language like available or will install is not acceptable.

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

6.4.5 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.

6.4.6 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 part of QAP and shall be submitted.

6.5 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 6.0

Prepared By SSE/Design	Checked By AEE/Design	Issued By Dy.CEE/D-II
---------------------------	--------------------------	--------------------------

Page 8 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

7.0 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 full fill 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.

Foundry facility is not required for this particular item.

8.0 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:

- Micrometer.
- Scale/Measuring Tape.
- Digital Ammeter & Voltmeter suitable for Product.
- Megger
- Variable Voltage Source.
- Variable Current Source both AC & DC.
- Variable mA Source Suitable for Product.

9.0 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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---------------------------	--------------------------	--------------------------

Page 9 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
--------------	--------------------------------	----------------------------------	---------

ANNEXURE – I

10.0 LIST OF DRAWINGS, SPECIFICATIONS AND STANDARDSFOR EARTH RETURN BRUSH WITH BRUSH HOLDER ASSEMBLY FOR THREE PHASE ELECTRIC LOCOMOTIVES

Sl.	Specification/Drawing/Standard	Description
1	CLW/ES/3/0017	Specification for Earth Return Brush with Brush Holder Assembly.
2	CLW/ES/3/SK-1/0017	General arrangement of Earth Return Brush with Brush Holder
3	CLW/ES/3/SK-2/0017	All accessories for assembling the carbon brush
4	CLW/ES/3/SK-3/0017	Over all dimension of carbon brush with connector cable.
5	IEC-60467	Test Procedures For Determining Physical Properties Of Carbon Brushes For Electrical Machines.
6	IS:304	High Tensile Brass Ingots and Castings

Note:- Firm should have latest all standard and documents.

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---------------------------	--------------------------	--------------------------

Page 10 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
---------------	--------------------------------	----------------------------------	---------

ANNEXURE – II

LIST OF MACHINERY AND PLANT

Sl.	Name of Machinery & Plant	Capacity / Rating	Essential/ Optional **
1.	Cutting machine	Standard	Essential
2.	Drilling Machine	25 mm	Essential
3.	Shaping machine	Standard	Essential
4.	Lathe machine	3 feet minimum	Essential
5.	Bending machine	Suitable for product	Essential
6.	Press machine	20 Ton (Min.)	Essential
7.	Filing machine	Standard	Essential
8.	Spray painting machine	Standard	Essential
9.	Tapping machine	Standard	Essential
10.	Broaching Machine	5 Tons	Essential
11.	Grinding machine / Buffing machine	Standard	Essential
12.	Bench Vice	Standard	Essential
13.	Working Table	Standard	Essential
14.	Tools, Dies, Jigs and Fixtures	As per requirement of product	Essential
15.	Casting facility	Suitable for product	**Optional
16.	Tin plating facility	Suitable for plating of Brush Holder	**Optional

** Optional activity means the facility is actually essential but can be out sourced from CLW/BLW/RDSO approved vendors or ISO certified firm and documentary evidence of same should be produced.

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---------------------------	--------------------------	--------------------------

Page 11 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
---------------	--------------------------------	----------------------------------	---------

ANNEXURE – III

LIST OF MEASURING AND TESTING EQUIPMENTS

SL. No.	Name of Measuring & Testing	Capacity / Rating	Essential/ Optional **
1	Vernier calipers	0 to 300mm (LC 0.02/0.01mm)	Essential
2	Digital Multimeter	Max. 1000 V /650 mA	Essential
3	Megger	1000V DC (min.)	Essential
4	Measurement of Electrical Resistance of Brush Contact/Flexible Connection (Digital Micro-ohm meter)	0.1 $\mu\Omega$ to 20 k Ω	Essential
5	Measurement of Average Pressure of the Brushes on Brush Holder Assembly/ Push pull gauge	50 N	Essential
6	Measurement of the pull strength of temped or moulded connection (Tensile testing machine)	1000 N	**Optional
7	Digital temp. indicator	Min. 120 °C	Essential
8	Torque wrench	0-50 Nm	Essential
9	High Voltage Test Set	Min. 5 KV	Essential
10	Digital weighing machine	Standard	Essential
11	Mili-volt drop testing machine/ Current injector machine	0-500 mV (Min.) /1000 A	Essential

**Optional activity means the facility is actually essential but may be carried out only from NABL accredited lab or any other Govt. of India authorized laboratory and documentary evidence of same should be produced.

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---------------------------	--------------------------	--------------------------

Page 12 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
---------------	--------------------------------	----------------------------------	---------

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)

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)	(a)	(b)	(c)	(d)	(e)	(f)

Prepared By SSE/Design	Checked By AEE/Design	Issued By Dy.CEE/D-II
---------------------------	--------------------------	--------------------------

Page 13 of 13	Issued on the date of Approval	STR No. CLW/2023/ELDO/E/STR/0177	Rev '0'
---------------	--------------------------------	----------------------------------	---------

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/ Product/ Process	Instrument/ Jig & Fixture test bench used	Parameter for inspection	Sample size & its frequency of Inspection	Document Reference	Acceptance Limit/criteria/specified 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)

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)

Note:- For Firm's guidance, firm may follow the detailed QAP format as given below:

[clw.ggn.rcil.gov.in → Vendor approval → Instructions for vendor approval → QAP Format]

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