

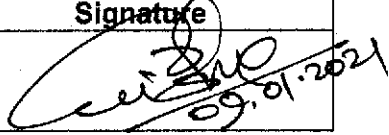
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**SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF  
EARTHING SWITCH FOR VCB**




**FOR 3-PHASE ELECTRIC LOCOMOTIVES AS PER SPECIFICATION No.CLW/ES/3/0010**

**ISSUED BY**

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

<b>Approved By</b> PCEE	<b>Signature</b>  09.01.2021
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<b>Recommended By</b> CEE/D&D	<b>Signature</b> अभिजित
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**1.0 NAME OF EQUIPMENT: EARTHING SWITCH FOR VCB.****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**

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 BLW/CLW/RDSO 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 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, Varanasi
IS	Indian Standards
IEC	International Electro Technical Commission
ISO	International Standards Organization
NABL	National Accreditation Board for Testing and Calibration Laboratories
RDSO	Research Designs & Standards Organization
VDE	Verband Deutscher Elektrotechniker
IP	Ingress Protection

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**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 BLW/CLW/RDSO for approval.

**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.




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- 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 BLW/CLW/RDSO.
- 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

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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 BLW/CLW/RDSO approved sources wherever applicable or from reputed suppliers if no BLW/CLW/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.
- 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 MANUFACTURING**

- 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:

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- 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 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.

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.

#### 6.4 INSPECTION AND TESTING PLAN



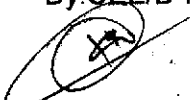
6.4.1 Testing setup should be available in the firm's own premises capable of testing the equipments as specified in the relevant technical specification.

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:


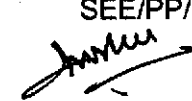
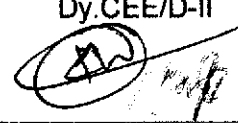
- Make and Model of the equipment
- Name of the manufacturer
- Accuracy
- Capacity or Range
- Date of Calibration
- Due date of calibration
- Agency of Calibration

Vague language like available or will install is not acceptable.

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- 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 form part of QAP and shall be submitted.

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#### 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.

#### 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 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.

Foundry facility is not required particular for this item.


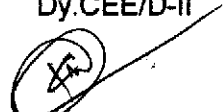
#### 8.0 REQUIREMENTS OF ELECTRICAL AND ELECTRONICS LAB

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:

- Digital Ammeter & Voltmeter suitable for Product
- Continuity Tester
- Megger 1/2.5 KV
- Dial Gauge
- Vernier Caliper & Micrometer
- Variable Voltage Source
- Variable Current Source both AC & DC
- High Voltage Test kit – 5KV

#### 9.0 STORAGE FACILITY

- Adequate Dust free, clean and non - humid environment for storage of raw materials 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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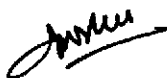



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ANNEXURE - I

**LIST OF DRAWINGS, SPECIFICATIONS AND STANDARDS**

- Specification No.:CLW/ES/3/0010.
- Relevant IEC/IS: STANDARD.

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

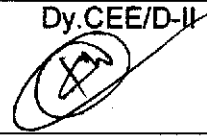
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## ANNEXURE – II

LIST OF MACHINERY AND PLANT:-

Sl. No.	Name of Machinery & Plant	Capacity / Rating	Essential/ Optional Facility	Remarks
1.	Aluminum gravity die casting machine	As per requirement	Optional	For preparation of upper & lower body frame
2.	Lathe Machine	8" 2HP	Essential	For boring of lower & upper part, side cutting, shaft & bush turning & finishing etc.
3.	CNC Machine/CNC Turning Centre Machine	Standard	Essential	For shaft & bush turning, drilling, boring, side cutting & finishing etc.
4.	Vertical Milling Machine	Standard	Essential	For machining, drilling, boring, side cutting & finishing etc.
5.	Vertical Machinecentre	Standard	Essential	For boring key way, drilling machining
6.	Drill Machine.	20 mm	Essential	For drilling purpose
7.	Tapping Machine.	Standard	Essential	For tapping purpose
8.	Broaching machine or equivalent machine for this job	Standard	Optional	For inside Key way cutting
9.	Computerized Key Cutting Machine	Standard	Optional	For Key cutting
10.	Power press Machine	3 Ton	Essential	For Cutting blank key
11.	Precision Cutting Machine	Standard	Essential	For precision cutting (back plate of lock)
12.	Plating Facility	--	Optional	For tin plating on the bar
13.	Powder coating paint facility	--	Optional	For powder coating
14.	Braded Cable Preparation facility	--	Optional	For braded cable preparation
15.	Clean & dust free area	--	Essential	For assembly purpose

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

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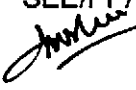
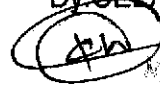
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## ANNEXURE – III

**LIST OF MEASURING AND TESTING EQUIPMENTS**

Sl. No.	Name of Measuring & Testing	Capacity / Rating	Essential/ Optional Facility	Remark
1.	Vernier Caliper	0-200 MM	Essential	For measuring purpose
2.	Scale & steel tape	0-1 meter	Essential	For measuring purpose
3.	Digital Multimeter	100mV to 1000V DC, 100mV to 750V AC, 100 $\mu$ A to 10A AC & 100 $\Omega$ to 100M $\Omega$ .	Essential	For measuring resistance, voltage & current
4.	Tensile testing machine	40KN	Optional	For measuring the Tensile Strength
5.	Digital temperature indicator	-80°C-250°C	Essential	For measuring the temperature
6.	Mili-volt drop test meter	0-6V/0-100A, 0-200mV.	Essential	For contact resistance measurement
7.	Galvanizing thickness measurement instruments	0-2000 $\mu$ meter	Optional	For galvanizing thickness measurement
8.	Height gauge	0-300mm	Essential	For measuring height
9.	DC current source	1000 A DC Min.	Essential	For 1000 A DC current injection
10.	Endurance test set up with counter	Suitable for product	Essential	For sustain the continuous loads.
11.	Interlocking test arrangement	Suitable	Optional	For interlocking test

\*\*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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## 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)

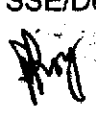

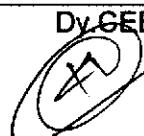
Document Reference	Record Format No.	Action in case of rejection
(f)	(g)	(h)

**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 Instruction Ref.	Jig & Fixture Drg. Ref	In-house/ outsource
(a)	(b)	(c)	(d)	(e)

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#### 4. Stage Inspection / Test Plan

Subject/ 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/ 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)


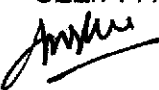

#### 6. Calibration Plan

Part I (A): In-house Testing facilities available for calibration with the firm

SN	Name of Master	Make	Range	Frequency of calibration	Traceability to national standard

Part I (B) : Personnel trained for in-house calibration

SN	Name	Qualification	Experience

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Part-II: Details of Equipment's & 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. Details of Sub-Assembly /Components /Raw material manufactured in-house and out sourced;



Part-I: Details of in-house manufactured components:

SN	Item name	Drawing No.

Part-II: Approved Sources for Raw Materials / Sub-Assembly/Consumables

Sub-Assembly/Raw Material / Consumable	Specification /Drawing No./ Standard	Source with Address	Whether Source is controlled by BLW/CLW/RDSO/ Others	Frequency of review of the performance of sublet source
(a)	(b)	(c)	(d)	(e)

**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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