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SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF 'OIL PUMP WITH MOTOR FOR TRANSFORMER'

FOR 3-PHASE ELECTRIC LOCOMOTIVES AS PER SPECIFICATION No.CLW/ES/3/0106

ISSUED BY

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

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1.0 **NAME OF EQUIPMENT**: Oil Pump with Motor for Transformer.

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/BLW/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
DIN	Deutsches Institut für Normung
BLW	Banaras Locomotive Works
IS	Indian Standards
IEC	International Electro Technical Commission
ISO	International Standards Organization
NABL	National Accreditation Board for Testing and Calibration Laboratories

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RDSO	Research Designs & Standards Organization
VDE	VerbandDeutscherElektrotechniker
IP	Ingress Protection
IACS	International Annealed Copper Standard

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/BLW/RDSO for approval.

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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/BLW/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

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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 / BLW 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.

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.

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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 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.

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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 form 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.

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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 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

- Specification No. CLW/ES/3/0106
- IEC 34-1& 23, IEC 34-1 & 21, DIN 42579& 6.2, IEC 1133 & 5.6, IEC 34-1&15, IEC 34-1 & 17, ISO 9905 &6.3, ISO 3555, IEC 34-1 &20, IEC 34 &16, ISO 9905, ISO 3555, DIN 42579, IEC 38, IEC77/1968 and 165/1973 or Latest.

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ANNEXURE – II

LIST OF MACHINERY AND PLANT: -

Sl. No.	Name of Machinery & Plant	Capacity / Rating	Essential/ Optional Facility	Remark
1.	Lathe M/c	Standard/ Small size	Essential	Require for machining/ finishing/shaping/chamfering
2.	Die casting facility	Standard capacity	Optional**	For die casting of rotor
3.	Vertical, Horizontal boring Machine	Standard size	Essential	For boring of motor body
4.	Drilling Machine	0-25 mm	Essential	For drilling holes of different sizes.
5	Grinding Machine	100 mm x 30 mm	Essential	For surface grinding and smoothing
6	Coil winding, molding and stretching machine	Standard capacity	Essential	For preparation of motor winding
7	Shearing Machine	Standard/Small size	Essential	For shearing / cutting the job
8	Hydraulic press	Standard/Small size	Essential	For shaft and bearing press
9	Induction heater	Standard/Small size	Essential	For bearing fitment
10	Dynamic Balancing Machine	Standard capacity	Essential	For balancing motor and impeller
11	Weighing machine	Min. 300 Kgs.	Essential	For weighing purpose
12	Welding machine	MIG machine Capacity-350 Amps & above	Essential	For welding purpose
13	Vacuum impregnation plant	Standard capacity	Essential	For preparation of winding
14	Oven with automatic cut off and cut in	0-300°C	Essential	For heating purpose
15	Soldering and brazing facility	Standard capacity	Essential	For brazing of winding terminals
16	Torque Wrench	Standard size	Essential	For tighten flanges and elbows

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17	Miscellaneous tools e.g., rubber faced mallet, wire cutter etc	Standard size	Essential	For different type of work
18	Spray gun for painting facility	Suitable capacity	Essential	For Painting of material
19	Crane facility /Fork lifter/trolley	Min. 100Kg	Essential	For material handling
20	Proper Jig & Fixture, Surface table, Punching & Labeling Arrangement.	As per requirement	Essential	For accurate shaped & size and also for identification/traceability of the job.

** 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.

ANNEXURE – III

LIST OF MEASURING AND TESTING EQUIPMENTS

Sl. No.	Name of Measuring & Testing	Capacity / Rating	Essential/ Optional Facility	Remark
1.	Vernier Caliper	0-150 mm & 0-300 mm	Essential	For measuring of dimension.
2.	Micro Meter	0-50 mm	Essential	For accurate measurement of Diameter
3.	Scale&Steel Tape	0-1000 mm & Min. 2mtrs. length	Essential	For dimension measurement
4	Sock Pulse Meter (SPM)	Standard	Essential	For bearing condition measurement
5	Vibration meter	Standard	Essential	For measurement of Vibration
6	Surge tester	5 KV (min)	Essential	For measurement of surge test
7	High voltage Tester	3.3 KV (min)	Essential	For measurement of High voltage
8	Ammeter, Voltmeter of various ranges with accuracy of 0.2	Suitable capacity	Essential	For measurement of current and voltage, Frequency, p.f and power during test
9	Frequency meter	Suitable capacity	Essential	
10	Power factor & KWH meter	Suitable capacity	Essential	
11	Megger	500V and 1000V	Essential	For measurement of Insulation resistance
12	Multimeter	500V and 1000V	Essential	For measurement of voltage, current

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13	Ohm meter/ resistance measurement facility	Suitable capacity	Essential	For measurement of resistance
14	Mercury thermometer, Infrared thermometer	0-200°C	Essential	For measurement of Temperature
15	Tachometer (non-contact type)	Min 3000rpm	Essential	For measurement of speed at running condition
16	Various CTs & PTs	Suitable capacity	Essential	For reduce of supply voltage and current as require
17	Compressor	Min 6kg/cm ² pressure produce capacity	Essential	Required for testing of pressure
18	Test panel for motor testing with variable voltage variable frequency (VVVF) control	Suitable capacity	Essential	For testing of motor and pump set

Pump Characteristics Testing Rig Consisting of :

Sl. No.	Name of Measuring & Testing	Capacity / Rating	Essential/ Optional Facility	Remark
1.	Reservoir Tank	Suitable capacity	Essential	For testing of Pump test
2.	Graduated tank	Suitable capacity	Essential	
3.	Various expanders, Reducers, flanges, elbow & Straight Pipes for connectors	Suitable size	Essential	
4.	Gate Valves	Suitable size	Essential	
5.	Pressure Gauges	Suitable size	Essential	
6.	Vacuum test bed	Suitable capacity	Essential	
7.	Hg. Manometer	Suitable capacity	Essential	
8.	Water pump test tank	Suitable capacity	Essential	
9.	Hot water test bed	Suitable capacity	Essential	

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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)	(d)	(e)	

4. Stage Inspection / Test Plan

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Subject/ Process	Product/	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/	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

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 CLW / RDSO / DLW/ Others	Frequency of review of the performance of sublet source
(a)	(b)	(c)	(d)	e

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DEBI PRASAD KONAR Digitally signed by DEBI PRASAD KONAR Date: 2023.04.10 17:50:04 +05'30'	CHANDAN KUMAR Digitally signed by CHANDAN KUMAR Date: 2023.04.10 18:27:04 +05'30'	ANSHU KUMAR VERMA Digitally signed by ANSHU KUMAR VERMA Date: 2023.04.11 14:06:25 +05'30'