

SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF LARGE FABRICATED ITEM (MS) FOR THREE PHASE LOCOMOTIVES

ISSUED BY

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

Approved by	Signature
PCEE	

Recommended by	Signature
CEE/D&D	

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SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF FOLLOWING FOR THREE PHASE ELECTRIC LOCOMOTIVES:-

1.0 NAME OF EQUIPMENT

- MS Fabricated items (large) Category Structural
- i) Duct Assembly for WAG-9, P-7, P-5
- ii) Drivers Desk (Bare)
- iii) General Arrangement of floor ventilation ducting
- iv) Junction Box Assly. & Body Side & Floor Secondary Member for WAG-9/WAP-7

2.0 APPLICATION

Used in Three Phase (WAG9/ 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 Large-fabricated items are the vital parts of Electric Locomotive on Indian Railways. The Schedule of Technical Requirement (STR) mentioned here under is issued to serve as a guide to manufacturer (Firm) and should be read in conjunction with the relevant drawings. The firm should satisfy themselves having complied with requirement of the drawing & STR. The requirement is meant to serve as guidelines only and is not exhaustive.

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:

- a). The firm should have currently valid ISO-9000 Certification issued by an approved agency and NSIC/SSIC Registration.
- b). 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 the firm.

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- c). The firm shall have a system of documentation in respect of rejection at customer end, warranty replacement and failure of item supplied by them during service.
- d). The firm shall have a system of recording the plant, machinery and control equipments remaining out of service nature of repairs done etc.
- e). The testing and measuring equipment shall be duly calibrated and the validity of calibration certificate issued by the calibration agency from whom it was calibrated.
- f). The firm shall have a system of easy traceability of the product from manufacturing stage to finished product stage. Stamped identification marking with serial number of beam should be used for this purpose.
- g). The firm should have sufficient finished floor area for input raw material storing.

QUALITY REQUIREMENTS

- a).Quality Assurance Process of Incoming Materials used for the subject items-

Test results of incoming raw material with reference 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 and Sources of supplies as approved by the firm to be specified.
- b).Quality Assurance System-

Stage wise Inspection procedure, inspection parameters and method of testing to be specified. Records of test results of the same should be available and furnished.
- c).Welding process – Welding-quality & finish are to be ensured at each stage.
- d).Proper Jig & Fixture should be available.
- e). Details of Quality Control Organization along with key personnel engaged in the QC function.

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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
 - 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 Vendor approving agency.
- 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.

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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.

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

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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.
- 5.3.2 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.
- 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.

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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

• 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

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6.0 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 Mmeter & voltmeter suitable for Product
- L, C, R Meter
- Continuity Tester
- Megger 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

Item Description	Drawing No	Specification No
Duct Assembly for WAG-9, P-7, P-5		CLW/MS/3/099 CLW/MS/10/048
Drivers Desk (Bare)	1209-08.130-017 (Sheet 1 of 2) & (sheet 2 of 2) 1209-08.130-018 (Sheet 1 of 2) & (sheet 2 of 2) 1209-08.130-016	CLW/MS/3/117
General Arrangement of floor ventilation ducting	IB021-00326, IB021-00327, IB021-00360 IB021-00450, IB021-00451	CLW/MS/3/154
Junction Box Assly. & Body Side & Floor Secondary Member for WAG-9/WAP-7	IB051-00218, IB051-00227 IB031-00277	

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ANNEXURE – II

4. MACHINERY & PLANT (M&P) FOR MANUFACTURING

Sl. No.	Description	Capacity/ Rating	Remarks	Essential/Optional
1.	Templates, jigs and fixture for cutting of plates as per required geometry. For small items punching and proper dies to be issued to get constantly accurate shaped and size.	Suitable size	To get constantly accurate shaped and size.	Essential
2.	Milling machine (desirable) for edge preparation.	Standard	Require for edge preparation	Essential
3.	Bending machine/ Press Brake M/c	Standard	For bending purpose	Essential
4.	Rolling M/C	Standard	Require for straightening Sheet/plates.	Essential
5.	Welding Arrangement (Arc welding/MIG welding M/c	Standard	Required for Welding purpose.	Essential
6.	Lathe M/c (CNC desirable)	Standard	Required for machining purpose.	Essential
7.	Shearing M/c/Power Hacksaw /Nibbling M/c	Standard	Required for shearing and cutting.	Essential
8.	Drilling M/c with tapping arrangement of sufficient bed length	Suitable Size	Required for Drilling / tapping purpose.	Essential
9.	Grinding M/c	Suitable Size	Required for grinding purpose	Essential
10.	Marking / Measuring table of suitable size & Facilities of Stamping of identification markings as per specification.	Standard Size	Require for Marking / Measuring/ Stamping / identification markings.	Essential
11.	Crane / Proper handling facility as per requirement.	-----	For shifting/ placement the job.	Essential
12.	Cleaning and Primer painting (Spray painting machine).	-----	For cleaning and painting the job.	Essential

** Optional activity of Machinery & Plant facility may be outsourced. However the subvendor is also to be assessed.

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ANNEXURE – III

LIST OF TESTING & MEASURING FACILITIES :

- i).Valid calibration certificate of the testing & measuring equipment.
- ii).Adequately trained and qualified by recognized agency and experienced Inspection staff for conducting non-destructive tests.
- iii).Adequate skilled, competent and sufficient trained staff for conducting tests likes chemical analysis and mechanical properties.

Sl. No.	Name of Measuring & Testing	Capacity / Rating	Essential / Optional **
1	Steel scale (other Gauges)	Standard	Essential
2	Steel tape (other Gauges)	Standard	Essential
3	INSIDE & OUT SIDE Caliper	Standard	Essential
4	Vernier Calipers	Standard	Essential
5	Micrometer	Standard	Essential
6	Dye Penetrate Test (DPT)	Standard	Essential
7	Magnetic Particle Inspection (MPI)	Standard	Essential
8	Spirit level	Standard	Essential
9	Universal testing machine	Standard	Essential
10	Direct reading hardness tester machine	Standard	Essential
11	Water spraying arrangement	Standard	Essential

** Optional activity of measuring & testing facility may be outsourced. However the sub vendor is also to be assessed .

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ANNEXURE

LIST OF LARGE FABRICATED ITEMS (MS) OF ELECTRIC LOCOMOTIVES.

Sl.	Item Description	Remarks
1.	Frame work for AC – 2 cabinet (WAG-7)	
2.	Arrangement of Driver's Desk & Lateral Desk (WAG-7)	
3.	Battery box with mounting arrangement (WAG-7)	
4.	General arrangement of Security Panel (WAP-4)	
5.	RPS Cowl (WAP-4)	
6.	BA1, BA2, BA3 panels (WAG-7) (Bare)	
7.	RPS Cowl (WAG-7)	
8.	BA1, BA2, BA3 panels Frame Assembly with cable stiffener arrangement (WAP-4)	
9.	General arrangement of security panel (WAG-7)	
10.	Frame work for AC-2 cabinet with cable stiffener (WAP-4)	
11.	Frame work for panel mounted brake equipment (Main)	
12.	Driver's Seat & Installation (WAG-7)	
13.	Cab side door LH & RH (WAG-7)	
14.	Corridor door (WAG-7)	
15.	Corridor door assly. (WAP-4)	
16.	Frame work for AC-1 cabinet (WAG-7)	
17.	Driver's Desk (Bare) for 3-ph. locomotives	
18.	Duct Assembly for WAG-9, WAP-5 & WAP-7	

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ANNEXURE – IV

FORMATS TO BE SUBMITTED WITH QAP

Item	Enter Item Name here	Date:	Enterdate
Specification:	Enter Specification No. here		

FIRM DETAILS:

Firm Name	
Address	
Contact Person	
Email	
Phone	
Mobile No.	

Firm Name & Logo		
	Signature of Quality Head	Page No

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Item	Enter Item Name here	Date:	Enterdate
Specification:	Enter Specification No. here		

Amendment History:

Sl.No.	Amendment Date	Version	Reason for Amendment

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

Purpose:
Purpose of QAP.....

1. Scope of Application:

Applicable for

2. Item Details:

Item Name	
Specification no.	
Drawing no.	
STR No.	

3. Reference Documents:

If Any.....

4. Organization Setup

4.1. Organization Chart

Complete Organization setup to be given including:

- a) Production setup
- b) Quality Control setup
- c) After Sales & Service setup
- d) R&D/Design setup

4.2. Qualification of Personals

- a) Production

Sl.No.	Name	Dsgn.	Qualification	Experience	Remarks
Firm Name & Logo			Signature of Quality Head		Page No.

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

b) Quality Control

Sl.No.	Name	Dsgn.	Qualification	Experience	Remarks

c) After Sales & Service

Sl.No.	Name	Dsgn.	Qualification	Experience	Remarks

d) R&D/Design

Sl.No.	Name	Dsgn.	Qualification	Experience	Remarks

5. Manufacturing Process

5.1. Process Flow Chart

- Stage wise manufacturing process flow chart to be given
- Clearly state work instruction/checklist to be followed

Firm Name & Logo		
	Signature of Quality Head	Page No.

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

5.2. Machinery and Plant (M&P)

Sl.No.	IS/STR/Specification para no	Requirement of M&P as per IS/STR/Specification		Details of the M&P available with the firm					
		M&P name	Range / Capacity of M&P	Name of M&P	Model	Make	Machine no.	Year of Built	Range/ Capacity

5.3. Testing & Plant

Sl.No.	IS/STR/Specification para no	Requirement of T&P as per IS/STR/Specification		Details of the T&P available with the firm					
		T&P name	Range / Capacity of T&P	Name of T&P	Model	Make	Machine no.	Year of Built	Range/ Capacity

5.4. Details of Sub-assemblies/Components Manufactured

a) Part I: Details of in-house manufactured (Components/sub-assemblies)

Sl.No.	Item Name	Drawing No

b) Part II: Details of components/Sub-assemblies purchased from CLW/RDSO approved vendors

Sl.No.	Item Name	Drawing No	Approved source of RDSO/CLW	Name/Address of the source

Firm Name & Logo		
	Signature of Quality Head	Page No.

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

c) Part III: Details of items outsourced from other than CLW/RDSO approved items

Sl.No.	Item Name	Drawing No	Name/Address of the source

5.5. Details of Sub-vendors

Sl.No.	Vendor Name	Item Name	ISO Certified (Yes/No)	QAP Approved (Yes/No)	Frequency of review of the performance of sublet source

Note: Following points to be taken in due consideration in providing information about manufacturing process:

- Details of Work Instruction for each stage as mentioned in process flow chart.
- Inspection in Plant (Stage & Final)
- Bill of Material
- Stages of manufacturing should be clearly indicating that
- M&P and T&P required for each stage should be clearly mentioned.
- Pre manufacturing stage and after manufacturing stage inspection & testing should be clearly mentioned along with checklist.
- Checklist should be attached with the QAP.
- Please attach ISO certificates of sub-vendors.

6. Quality Control

6.1. Quality Certification

- ISO
- Any other Document/certification

Firm Name & Logo		
	Signature of Quality Head	Page No.

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

6.2. Calibration Plan for Testing & Measuring Equipment

a) Part I : Inhouse Testing facilities available for calibration with the firm

Sl.No.	Name of Master	Make	Range	Frequency of calibration	Traceability to national standard

b) Part II : Personnel trained for inhouse calibration

Sl.No.	Name	Qualification	Experience

c) Part III : Calibration plan for the items identified for specified calibration in STR/Specification

Sl.No.	Measuring Equipment	Ref. para of STR/Spec.	Range/ Accuracy	Frequency Specified in STR/Spec	Inhouse/ Outsourced	Name of agency if outsourced

d) Part IV : Calibration plan for other measuring equipment

Sl.No.	Measuring Equipment	Range/ Accuracy	Frequency	Inhouse/ Outsourced	Name of calibration agency

6.3. Incoming Raw Material & In-process/Final Inspection

Stage inspection detailing inspection procedure, inspection parameters, method of testing/test procedure including sample sizes for destructive and non-destructive testing etc.

Firm Name & Logo		
	Signature of Quality Head	Page No.

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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

a) Part I: Incoming raw materials/parts/sub-assemblies

Sl.No.	Incoming Product/ assembly	Sample Size & its Frequency of inspection	In-house / outsourced	Checklist no.	Mode of inspection / equipment used	Rejection & Disposal	Traceability register no
						Reprocessed / Scrapped	

b) Part II: In process inspection (of the product)

Sl.No.	Name of the process	Sample Size & its Frequency of inspection	Checklist no.	Mode of inspection / equipment used	Rejection / Disposal	Corrective & preventive action	Traceability register no

c) Part III: Final internal inspection of the product by the firm

Sl.No.	Name of the test/ process	Sample Size & its Frequency of inspection	Checklist no.	Mode of inspection / equipment used	Rejection & Disposal	Traceability register no
					Reprocessed / Scrapped	

6.4. Handling of Rejected Material

- Please provide details

Firm Name & Logo			
		Signature of Quality Head	Page No.
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Item	Enter Item Name here	Date:	Enter date
Specification:	Enter Specification No. here		

6.5. System for Customer Complaints/Warranty Failures

Warranty failures/In-service failures reported from customers

Sl.No.	Date of report of complaint	Letter no	Complaint received from	Brief details of complaint	Classification of failure	Whether any person deputed for collecting field sample	Date of joint inspection	Failure analysis & cause of failure	Date of compliance in case of warranty	C & P action taken
					Warranty failure/ In service failure/ Call for joint inspection / Consignee end rejection / General complaints					

* The firm shall maintain a complaint register in the above format and the summary required to be given during renewal

6.6. Details of after Sales & Service

Name of Service Engineer	Location/Place	Contact Detail

7. Additional Information

- The firm can furnish any other information which they wish to submit on items other than furnished above.

Annexure:

- Work Instruction for each stage
- Inspection check sheet for:
 - Incoming material
 - In-process/stage inspection
 - Final material
- ISO Certificate
- Any other quality/design certification

Firm Name & Logo		
	Signature of Quality Head	Page No.

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Item	Enter Item Name here	Date:	Enterdate
Specification:	Enter Specification No. here		

Note:

1. QAP covering all the information as asked above under section ‘0’ to ‘I’ must be given in the form of single document indicating name and works address 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 Quality Control System of the vendor. A certificate to this effect shall be provided along with the QAP by the vendor.
2. One copy of the QAP, after final approval will be given back to the vendor for implementation.

Firm Name & Logo		
	Signature of Quality Head	Page No.

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