



LME:012: C

LOCOMOTIVE ENGINEERING DEPTT.

PURCHASE SPECIFICATION

LME/ PUR/

ISSUE DT:03.03.2011

REV.NO.- 00

REV. DT:

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SUBJECT:

PURCHASE SPECIFICATION FOR DESIGN MANUFACTURING INSTALLATION OF FIXTURES FOR MANUFACTURING OF SHELL ASSEMBLY OF WAG7 LOCOMOTIVE

Enclosures:

Rev	Date	Prepared	Rev	Date	Prepared	Rev	Date	Prepared
		Approved			Approved			Approved
Rev	Date	Prepared	Rev	Date	Prepared	Rev	Date	Prepared
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1. General:

BHEL Jhansi manufactures WAG7 electric locomotives for Indian Railways. The shell assembly is the major fabricated assembly of WAG-7 loco where all equipments are installed. It consists of Underframe assembly, Sidewall assembly (left hand and right hand) and cabin assembly (2 nos.). At present the total annual requirement of Underframe assembly is manufactured in house. The super structure assembly (side wall cabin and roof) is fabricated in house and is partially outsourced.

In order to increase the production capacity of locomotives and also to ensure consistency in quality we need to increase the manufacturing capacity of shell assembly up to 7 nos. per month by way of introducing proper jigs and fixtures at various stages of manufacturing of under frame and shell assembly.

This specification covers design, manufacture and installation of required jigs and fixtures at BHEL Jhansi works to achieve production rate of shell assembly of 7 nos. per month.

To understand existing process / stages of manufacturing of underframe and shell assembly the interested parties may visit BHEL Jhansi plant at least one week prior to the bid submission.

2. Technical requirement

- Achieve repeatability through maximum use of jigs & fixtures.
- Cycle time reduction to improve overall delivery cycle.
- Cut down on inventory cost, rework, rejection and cutting down inspection stages & inspection time by ensuring the quality.
- Training, Support & Supervision till the target of Shell @7 nos. per month is achieved for continuous 6 months.
- The Jigs and Fixtures shall be designed in such a way so that minimum time shall be required to load and unload the job on fixtures.
- The jigs and fixtures shall be robust enough to avoid any distortion during the welding.
- Easy removal of job after welding to be ensured, any welding distortion should not occur after removal of job from the fixtures.
- Clamping arrangement shall be designed in such a way so that adequate and easy access must be there for welding.
- Over head welding to be avoided, only down hand and vertical welding are allowed.

3. Scope of Work:

Design, manufacture, supply installation and to prove suitability of Jigs and fixtures for manufacturing the shell assembly of WAG7 locomotive as per drawing no.-**0 719 10 05 000** at BHEL Jhansi works. The manufacturing stages, no. of fixtures required to achieve the target of 7 nos. shell assembly and critical requirements for shell assembly shall be as under.

BHEL shall provide components duly prepared according to the BOM / component drawing to the vendor.

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3.1 STAGE-I

The description of sub assemblies, critical requirements and maximum cycle time including loading and un loading the job on fixtures shall be as given below

(i) Longitudinal End Beam

The end beam is a box section with the stiffeners inside as per annexure-1. Drawing no.- **27193105006 to be followed at this stage**. 2 nos. such end beams are required to form one long beam and 2 nos. long beams shall be required to manufacture one under frame.

3.1.1 Critical requirement

- Overall dimensions as per drawing.
- No welding distortion / twisting of beam.
- Fixture shall be so strong so that it should not allow any distortion in beam during welding.

3.1.2 Maximum Cycle Time 1.5 days *

3.1.3 No. of Fixtures 2 nos.**

3.1.4 Weight - 1404 Kg.

3.1.5 Welding Automation*** - required to the maximum extent

3.1.6 Welding manipulator**** - Rotation not required

(ii) Long Centre Beam

The center beam is a box section with the stiffeners inside as per annexure-1. Drawing no.- 17193105006 to be followed at this stage. One nos. centre beam is required to form one long beam and 2 nos. long beams shall be required to manufacture one under frame.

3.2.1 Critical requirement

- Dimensions as per drawing and check list.
- Weld size and weld quality to be maintained.
- Size of transformer well to maintained, shall be measured with templates.
- Pitch and location of holes for transformer mounting to be maintained.
- Automatic / Mechanized welding is required to reduce welding vendor to supply suitable mechanism and welding plant preferably submerged arc welding to cater this requirement

3.2.2 Maximum Cycle Time 3 days*

3.2.3 No. of Fixtures 2 nos.**

3.2.4 Weight - **2396 kg**

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3.2.5 Welding Automation - required to the maximum extent

3.2.6 Welding manipulator - Rotation not required

3. 3 Long Beam

The long beam is to be manufactured by joining 2 nos. end beams (3.1 of above) and one no. centre beam (3.2 of above) as per drawing no.-07193105002, 2 nos. long beams shall be required to manufacture one under frame.

3.3.1 Critical requirement

- Over all dimensions as per drawing
- Ultrasonic testing of butt weld as per drawing
- Cambering of long beam
- Flatness of top surface of long beam shall be within ± 2 mm.
- Side deflection of the beam shall be within 5 mm.

3.3.2 Maximum Cycle Time 3 days. *

3.3.3 No. of Fixtures 2 nos.**

3.3.4 Weight - 5204 kg

3.3.5 Welding Automation - Not required

3.3.6 Welding manipulator - Rotation not required

3.4 End structure

The end structure to be made as per drawing no.- 07193105007. 2 nos. end structures are required to make one under frame.

3.4.1 Critical requirement

- Over all dimensions as per drawing
- weld joints as per drawing
- ensure matching with buffer beam, and long beam in stage-II
- Flatness of bottom portion to match with cattle guard
- To ensure accurate placement of pre drilled components.


3.4.2 Maximum Cycle Time 3 days*

3.4.3 No. of Fixtures 2 nos. **

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3.4.4 Weight - 2256 kg

3.4.5 **Welding Automation** - Not required

3.4.6 **Welding manipulator** - Rotation not required

5. Stage-II Under frame assembly

A. Right way Up (RWU)

After manufacturing the long beam fixtures are required for stage-II i.e. Right Way Up position. At this stage both the long beams are kept in position and cross members and other items as per list enclosed at Annexure-2 are to be welded. The major activities at this stage are as under.

General arrangement drawing no. -07193105008 to be followed at this stage.

- locate both the long beam in position
- Place cross members as per drawing
- place side channel and supporting gussets
- Place both the end structures
- Under frame extension as per drawing
- damper bracket support

3.5.1 Critical requirement

- Dimensional measurement as per drawing and check list
- Flatness and right angle vertical of side channel
- Ensure accurate location of predrilled components
- Ensure accurate location and welding of cross members as per drawing.
- **No twisting is allowed after welding**
- **Only down hand and vertical welding is allowed.**

3.5.2 **No. of fixtures** 3 nos.**

3.5.3 **Weight of under frame** - 20t appr.

3.5.4 **Maximum cycle time** 10 days*

3.5.5 **Welding Automation** - required to the maximum extent

3.5.6 **Welding manipulator** - required, to ensure down hand welding the items which are to be welded from top shall be welded in right way up position and then with the help of manipulators complete under frame to be rotated in 180 degree to facilitate the bottom side welding in down hand position.

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B Stage-III Up Side Down (USD)

After completion of stage-II i.e. RWU stage as stipulated above in para 3.5 the position of under frame is made reversed i.e. under frame is placed upside down (USD) position through manipulator and the items which are to be fitted / welded on to the under frame at this stage have been listed in Annexure-3. **General arrangement drawing no.- 07193105008 to be followed at this stage.**

3.5.7 Critical requirement

- Dimensional measurement as per drawing and check list
- Ensure accurate location and welding of pivot pin .
- Location of secondary suspension pad with reference to pivot
- Ensure accurate location of predrilled components
- Ensure accurate location and welding of other items listed in annexure-II
- MCD / DP testing of pivot welding

3.5.8 No. of fixtures 2 nos.**

3.5.9 Maximum cycle time 6 days including loading and unloading time*

3.5.10 Weight of under frame - 22.5t appr.

3.5.11 Welding Automation - Required to the max. extent

3.6 Stage-IV Stool mounting stage

No additional fixtures required for this stage the welding of stools to be done in RWU position as mentioned above para 3.5

3.6 Stage-V Body shell assembly

After completion of stage-IV i.e. after welding of mounting stool and measurement of camber the under frame is brought to stage -V. In this stage the super structure is welded on under frame

3.6.1 Activities in stage-V

- **Shell assembly to be done as per drawing no.- 0 719 10 05 000.**
- Decambering of under frame with help of the dead load
- Locate and match the side wall with under frame
- locate and match the cabins with under frame and side wall
- locate and weld the cross girders

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- match the roofs with cross girder and side wall
- match and weld the roof mounting brackets and I bolts
- Full welding of side wall with under frame following the specified welding sequence to avoid the distortion
- Full welding of both the cabins with under frame
- Fitment of corridor door and bulk head to be done as per drawing
- Fitment of cabin doors to be done as per drawing

3.6.2 Critical requirement

- Dimensions are to be maintained as per drawing and check list.
- Verticality of side wall and cabin to be maintained within +/- 2 mm with respect to the under frame
- Waviness of the side wall to be maintained within +/- 5 mm
- Uniform gap between side wall and roofs both from inside and outside to be maintained as per drawing
- uniform gap between two adjacent roofs to be maintained as per drawing
- Height from floor to the cross girders to be maintained as per drawing
- Height from floor to cabin roof to be maintained as per drawing.
- Level of two adjacent roofs and level of all four roofs are to be maintained.
- Gap between roof and cross girder from inside shall be uniform and to be maintained as per drawing.
- Location of side wall with reference to center line of under frame to be maintained within the specified tolerance.
- The inside dimensions between both the side walls to be measured 3 places in height and 6-7 places horizontally all the dimensions shall be within the limit. Similarly for the cabin the distance between both the sides to be measured 3 places vertically and no deviation from the specified limit shall be allowed.
- Placement of cabin with reference to center line of to be ensured as per drawing
- All sharp edges, corners, welding burrs to be removed and surface to be made smooth
- Inspection by RDSO staff for dimensions, finish and workmanship etc.

3.6.3 No. of fixtures required - 3**

3.6.4 Maximum cycle time - 10 days including inspection time*

* Time indicated for stages is purely BHEL assessment based on manufacturing experience to meet desired output i.e; 7 shells per month. However Vendor may quote their own assessment to meet the desired target.

** The number of fixtures we decided, is based on time taken for different stages and to meet desired output i.e; 7 shells per month. However vendor may quote their own assessment for number of fixtures to meet the desired target, Vendor has to prove the same during commissioning.

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*** **Welding Automation** - Robotic welding, vendor has to supply complete welding plant and other accessories for automatic welding

**** **Welding manipulator** - Mechanized rotating arrangement of welding fixture to facilitate welding in all position by rotating the fixture with job.

4. Details to be submitted along with offer:

- i. Details of similar projects done by party earlier, to be submitted with offer.
- ii List of Tools, Jigs and Fixtures proposed and wherever possible a General Arrangement drawing for the Tooling, jigs and fixtures
- iii Project schedule to be furnished by Party with offer.
- iv Organization chart clearly defining the production and quality control.
- v Clause wise comments against this specification
- vi Description of the company supported by the printed literature
- vii Certified Copies of Financial Report of last three year.
- viii. Foundations details if any shall be submitted with the offer.

5 Guidelines Regarding the Bid Submission:

- a. The Bidder shall prepare the bid in 2 parts i.e. techno-commercial bid and price bid and to be submitted in separate sealed envelopes clearly indicating the enquiry no. and techno-commercial bid and price bid on envelopes. Both envelopes are to be placed in the third envelop indicating the enquiry no. in top.
- b. The Bid shall contain no alterations, omissions or additions, except those to Comply with instructions issued by the BHEL Jhansi, or as necessary to correct errors made by the Bidder, in which case such corrections shall be done with proper initials.
- c. In the event of discrepancy between the original and any copy, the original shall prevail

6. Qualifying Criteria:

Bidder shall have wide experience in similar type of work i.e. design manufacturing erection and commissioning of the jigs and fixtures for fabrication, and assembly of components and carrying out heavy and light duty welding work. Bidder should submit documentary evidence for execution of a project of similar scale along with offer. Following shall also be applied.

- i. The Bidder shall be a registered private or public legal entity.
- ii. The Bidder has the requisite power and authority to submit the bid, and the Bid Security, and to execute the Agreement and perform its obligations there under.
- iii. The Bidder is not prohibited under any Applicable Law from submitting the bid or executing the Agreement and performing its obligations there under.
- iv. The Bidder has not been declared as a defaulter or debarred by any Government Authority from submitting the bid.

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- v. There is no pending, active, or previous legal action that prevents the Bidder from submitting the bid, executing the Agreement or fulfilling the conditions of the purchase specification.
- vi. Bidder should have well established design office and facility of solid modeling and designing of fixtures.
- vii. Organization chart of design office and facility for designing shall be submitted along with offer.
- viii. The bidder should have experience of supplying and commissioning of similar fixtures minimum at one customer
- ix. Vendor shall indicate detail of such customer in their bid documents.

7. Erection, commissioning & proving

- 1. The erection of the jigs, fixtures & tooling shall be in scope of the party.
- 2. BHEL shall provide electricity, compressed air, cutting gas and crane facility.
- 3. Civil work if any shall be in the scope of BHEL Jhansi.
- 4. Proving the facilities provided by party shall be considered established only when desired output i.e; 7 shells per month is achieved for continuous six months.
- 5. The final clearance to all the jigs and fixtures shall be given only when parts and assembly manufactured out of the newly designed facility shall be accepted by the inspection agency (RDSO).

8. Delivery:

The delivery shall be six months from the date of placement of order.

9. Other conditions:

- a) Supplier shall give the manufacturing/ assembly procedure for every fixture.
- b) The manufacturing time mentioned in this specification is indicative only. Supplier is supposed to improve significantly upon the same and for every fixture the manufacturing time is to be declared / mentioned by supplier. The same shall be proved by supplier in prototype manufacturing.
- c) Supplier shall be responsible for ensuring the quality of products using the fixture and the interchangeability. The fixture should be capable of producing components of same quality every time.

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