



**Government of India
Ministry of Railways**

**QMS-16:2014
(Revision 01)**

Schedule of Technical Requirements

For Infrastructure, manufacturing, testing and quality control requirements

for

Spring Steel Rounds to RDSO Specn.No. WD-01-HLS-94

Quality Assurance (Mechanical) Directorate
Research Designs & Standards Organisation
Manak Nagar, Lucknow – 226011

July' 2014

1. SCOPE

- 1.1 The schedule of technical requirements cover the norms for manufacture of spring steel rounds required for hot coiled helical springs used on mainline coaches, EMU stock, locomotives and freight stock.

2 REQUIREMENTS:

The vendors seeking approval shall comply with all the below mentioned requirements.

GENERAL AND MANUFACTURING FACILITIES

- 2.1 Minimum one Electric Arc furnace or Basic Oxygen Steel making furnace of nominal capacity of 20 T with adequate capacity transformer with eccentric bottom tapping or slag free tapping arrangement shall be available.
- 2.2 The process of steel melting shall be computerised or panel controlled or with any other suitable method of control to ensure proper operational control throughout the process.
- 2.3 Oxygen lancing facilities during primary melting to assist melting and bring down 'C' and 'P' to desired level to achieve final composition after ladle refining.
- 2.4 Steel making can be through virgin route or through melting of suitable scrap so as to have required chemistry of end product.
- 2.5 One Electromagnetic segregator may be available for segregation of scrap for classifying magnetic/nonmagnetic, for estimation of correct yield and removal of undesirable scrap to control trace elements.
- 2.6 Adequate handling facilities at all the shops shall be available in the form of overhead cranes, forklifts etc.
- 2.7 Demarcated storage area for storing Ferro Alloys shall be available.
- 2.8 Communication/ Announcement system shall be available for easy operation with quick coordination with various shops.
- 2.9 One Ladle Refining Furnace for heating the liquid metal must be available with inert Gas Purging. It shall have suitable alloy addition systems to achieve close chemistry range.
- 2.10 CaSi cored wire feeding machine (Roller type with flipping types spools) shall be available for achieving improvement in fluidity of steel while casting.
- 2.11 One Vacuum degassing station with watering pumps and steam ejectors or mechanical pumps for achieving desired vacuum level <1 millibar shall be available.
- 2.12 One Bloom / Billet Caster for casting blooms/billets of any shape of planned size to be rolled into rounds satisfying the Min. 16: 1 reduction ratio.

- 2.13** Electro Magnetic Stirrer to control segregation and achieve sound 'Macro' in blooms/billets should be available.
- 2.14** 2 Nos. Oxy- Acetylene Gas cutting facility on each side of bloom casting shall be available for cutting billets/ blooms after solidification.
- 2.15** Swing grinding machines/ Centro Maskin grinding machines to grind surface of billets for removing surface defects shall be available.
- 2.16** Melt chemistry shall be checked spectrographically through a vacuum emission spectrometer installed in close proximity to steel making shop. In case chemical Laboratory is situated far away from melting shop, arrangement to pass the samples pneumatically shall be available.
- 2.17** Immersion type Pyrometer control devices shall be available for measuring the temperature of the molten metal.
- 2.18** Arrangement for drying of ingredients of furnace charge and ladle additions shall be available.
- 2.19** Weighing facilities for ingredients and additives charge into furnace and ladle shall be available.
- 2.20** Drying arrangement for ladle and its accessories shall be available.
- 2.21** Minimum one continuous walking beam /Walking Hearth/Pusher type reheating furnace with temperature control for heating of blooms/ billets before rolling shall be available.
- 2.22** 2 hi/ 3 hi reversible or continuous rolling mill with adequate strands, with suitable cooling bed shall be available.
- 2.23** A fully equipped machine shop for 'rolls' and 'guides' grooving shall be available.
- 2.24** An online flue gas analyser or computerized control mechanism on rolling mill reheating furnace shall be available to control furnace atmosphere. Alternately furnace atmosphere shall be checked & monitored at regular intervals by offline flue gas analyser.
- 2.25** For effecting supplies in heat treated conditions, Bogie Hearth / Roller Hearth / Rectangular Electric Bell Type heat treatment Furnace with temperature controllers to accommodate min. 6 meter length bars for carrying out normalizing/ annealing / stress relieving should be available.
- 2.26** Skew Roll / Press straightening machine shall be available for straightening the bars to close tolerance.
- 2.27** Band saw/abrasive cutting machine for fixed length cutting rolled bars at desired tolerances shall be available. Flame gas cutting is prohibited.
- 3. TESTING FACILITIES:**
- 3.1** A vacuum emission spectrometer / Optical Emission Spectrometer with state of art facilities for verifying all elements specified in the standard.
- 3.2** Wet chemical lab /Spectrometer to test all input raw material shall be available.

- 3.3** Hydrogen, Nitrogen, Oxygen Gas Analysers shall be available to assess the limits of such detrimental gases in the melt.
- 3.4** Pickling facility for macro examination by acid etching with suitable heating arrangements shall be available for blooms/ billets/ rolled products.
- 3.5** Sulphur printing facilities/Macro etching facilities shall be available for assessing internal quality of Blooms/billets/rolled products.
- 3.6** Facilities for tensile test and Charpy impact test shall be available.
- 3.7** Hardness tester with standard test pieces shall be available for measuring the hardness.
- 3.8** Eddy current/ magnetic particle testing machines shall be available for testing full length of bars for detecting surface/ sub surface defects.
- 3.9** Ultrasonic testing facilities for checking the internal quality of billets / blooms.
- 3.10** One microscope with min. 400X along with computerised image analyser and photographic arrangement shall be available.
- 3.11** Sample preparation facilities like cutting, polishing, along with Bakelite mounting of samples shall be available.
- 3.12** Min. one oven for heating the rolled products shall be available along with water/ oil quenching facilities for carrying out hardenability test.
- 3.13** Weighing, bundling, strapping and labeling facilities shall be available.
- 3.14** Adequate test benches for carrying out detailed inspection of rolled products shall be available.
- 3.15** Standard charts of inclusion content (IS 4163/ ASTM E-45), grain size (IS 4748/ASTM E-112), macro levels (ASTM E-381) shall be available for display.
- 3.16** A storage area exclusively for storing material offered to RDSO shall be available.
- 3.17** All measuring instruments like tape, micrometer, verniers etc. shall be calibrated at regular frequency.
- 3.18** Adequate master samples for determining chemistry of samples shall be available.
- 3.19** Adequate steel letter punches/stamps for punching marking materials particulars like Heat No., Manufacturer's name, grade of steel etc should be available.
- 3.20** Facilities for dye-penetrant testing/magnetic particle testing shall be available for detecting surface/sub surface defects.

4. QUALITY CONTROL REQUIREMENTS:

- 4.1** There should be a system to ensure the traceability of the product from raw material stage to finished product stage. This system should also facilitate to identify the raw material composition from the finish product stage.
- 4.2** Ensure that there is a Quality Assurance Plan for the product detailing various aspects available as per requirements detailed in Guidelines for Vendor Approval (Registration) QM-G-7.1-3 Ver. (latest).
- 4.3** There should be at least one full time metallurgist having a minimum bachelor's degree in relevant field with 5 years experience. He should be free from day-to-day production, testing and quality control responsibility. He should be mainly responsible for development of a product, analysis of products, control over raw material, corrective action in case of difficulties in achieving the parameters
- 4.4** Ensure that the in-charge of the Quality Control Section is having a qualification of minimum bachelor's degree in the relevant field.. He should be actively involved in day- to-day activities of quality control / stage inspection/ compliance of QAP etc.
- 4.5** The firm should have acquired ISO: 9001:2008 series certification and the product for which an approval is sought should be broadly covered in the scope of the certification of manufacture and supply.
- 4.6** The Quality manual of the firm should clearly indicate at all stages the control over manufacturing and testing of the said railway product.
- 4.7** Proper analysis should be done on monthly basis to study the rejection at various internal stages and should be documented.
- 4.8** All the relevant specifications, drawings and IS standards (latest) should be available with the firm.
- 4.9** Adequate covered area for storage of final product, awaiting inspection should be available.
- 4.10** Ensure that proper record of complaints received from users (Railways) is being maintained and corrective action is taken.