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**Government of India  
Ministry of Railways**

**QMS-05:2000  
(Revision 0)**

*Infrastructural, manufacturing, testing & quality control requirements*

**Metal Bonded rubber components  
Elastomeric Pad**

*(Specification No. 20 - Misc. –1995 latest revision)*

**Inspection & Liaison Directorate  
Research Designs & Standards Organisation  
Manak Nagar Lucknow – 226011**

**February'2009**

**(Price Rs 700/-)**

## **1.0 Scope:**

- 1.1 The Schedule of Technical Requirements covers the norms for manufacture of elastomeric pads.

## **2.0 Requirements:**

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

### **General & Manufacturing Facilities:**

- 2.1 Covered area with adequate space for storage of raw rubber, carbon and chemicals should be available, which is free from dampness and humidity.
- 2.2 The weighing facilities for measuring various raw material constituents and the product at various stages.  
The following facilities are required:
- a. Electronic weighing balance of 2 to 5 kg. capacity
  - b. Mechanical spring balance or platform weighing machine of of the capacity of minimum 50 kg of reputed make
- 2.3 It is ensured that the weighing machines are calibrated regularly as per manufacturers / IS specifications.
- 2.4 At least three power presses of capacity 250 T, 150T, 100T should be available for shearing cutting, bending & punching steel plates of thickness up-to 10 mm.
- 2.5 At least one medium duty drilling machines should be available.
- 2.6 At least two sets of closed dies, fixtures and templates for cutting, blanking, punching, bending of steel plates as per the drawing requirements.
- 2.7 Bench grinding machine- minimum one no. to remove sharp edges from the sheared/blanked or bent steel plates should be available.
- 2.8 Atleast three sets of Go & No-Go gauges should be available to check the dimensional accuracy of the steel plates and also the product at intermediate stage & final stage.
- 2.9 Ensure that the Go & No-Go gauges are calibrated on due dates and the record is available. The Go & No-Go gauges should have a mention on it indicating the due date of calibration.

- 2.10 Ensure that minimum two no. shot blasting machines with table dia of at least 3 feet are available. The shot blasting machine shall have in-built facility of sieving to screen under size shots.
- 2.11 Ensure that the facility for degreasing is available. The process of cleaning should be proven one and capable of removing accumulated dirt/dust, black spot etc. The capacity of degreasing should be adequate enough.
- 2.12 Ensure that the suitable spraying facility exist for application of adhesive. The spraying machine shall have an in-built provision of stirring the adhesive.
- 2.13 The adhesive application shall be done in a separate room which is free from dirt/dust and having proper exhaust facility.
- 2.14 Ensure that elcometer or any other measuring equipment is available to measure the thickness of adhesive coats at primer application & final application stage.
- 2.15 Ensure that a system exists to measure the adhesive film thickness at the specified frequency and is recorded.
- 2.16 Ensure that a closed system exist to transport the steel plates after shot blasting till it is put on the moulding press for moulding. The system should have an inbuilt facility to take care for the various operations – Degreasing & Adhesive application.
- 2.17 A suitable capacity close mixing mill (Banburry) is preferable. However, availability of atleast one kneader/ internal kneader is essential.
- 2.18 Ensure that atleast one extruder to ensure uniform mixing is available.
- 2.19 Ensure that minimum one number open mixing mill for sizing of rubber sheets is available. The open mixing mill should be equipped with suitable cooling arrangement and digital temperature indicator.
- 2.20 An injection moulding machine of suitable capacity for manufacture of Elastomeric Pads. It may be horizontal or vertical and single or multi station machine which should have following sub-system –
- (i) Pre-plasticising and Injection system : It should be in-line screw design based on the principal of “First-in-first-out” system. It should be equipped with oil circulating and emergency cooling system to achieve precise temperature control.
  - (ii) Mould Clamping System : It should be hydro-mechanical or hydraulic system (the latter will be preferred). It should be able to provide the required load.
  - (iii) Hydraulic Power System : It should be able to supply sufficient oil pressure to operate all the press functions.

- (iv) Heating/Cooling System : It should be able to provide a consistently plastisized stock at uniform temperature. The temperature gradients across the platen should be restricted to  $\pm 2^{\circ}$ (max.). It should be able to provide emergency cooling in pre-plasticising and injection unit to prevent scorching of rubber in the event of prolonged delay in the moulding cycle and also help in maintaining uniform temperature.
  - (v) The Machine Control System : It should be equipped with programmable logic control system. Microprocessor based system will be preferred. All the functions of the machine as detailed above (i to iv) and also optional systems like material handling etc. which are directly connected to the machine should be controlled by this system.
- 2.21 Suitably designed Injection moulds for the prouduct ( min.2 Nos.) should be available.
- 2.22 Suitably designed dies and transfer moulds for the product (min. 2 no.) should be available.
- 2.23 It is ensured that the moulds are measured for its accuracy for various dimensions and profile atleast on weekly basis or after a production of 500 pieces which ever is later and the observations of the mould are recorded.
- 2.24 Ensure that the system exists to check the dimensional accuracy of the mould before its use if it is being used after a gap of considerable time period.
- 2.25 In-house availability of minimum infrastructure for maintenance and polishing of dies and moulds should be available.

**Testing Facilities:**

- 3.1 Controlled atmosphere laboratory to maintain standard temperature and humidity for rubber testing as per IS 13867 should be available.
- 3.2 A separate laboratory mixing mill & laboratory testing hydraulic press with temperature control, digital indicator, timer, & pressure guage should be available.
- 3.3 Tensile testing machines capable to read the load and elongation as per the requirement of the product should be available. The tensile testing machine should have all the provisions in accordance with para 4.2 of IS 3400 Part I.
- 3.4 A) Ensure that one universal testing machine with load indicator having a least-count of minimum 20 kg is available. The capacity of the machine should be adequate to work the same at specified speeds and it should be capable to apply the required load for testing of the

products for various deflection parameters within the stipulated specifications.

B) The universal testing machine should also have the facility to draw a graph for various deflection characteristics as per the requirement of the product.

- 3.5 Ensure that a rehometer is available and it is being used regularly. Ensure that the record is maintained of the batches, which are checked on rehometer.
- 3.6 Minimum two numbers air ovens should be available to facilitate the testing in accordance with para 4.2 & 6.2 of IS 3400 Part X.
- 3.7 Minimum one number muffle furnace should be available.
- 3.8 Ensure that minimum two numbers shore A hardness tester with standard test pieces are available.
- 3.9 Specific gravity testing apparatus, at least one number, should be available.
- 3.10 Ensure that the facility exist to check the viscosity of the adhesive.
- 3.11 Ensure that the facilities for preparing test specimen as per IS 3400 Part I are existing.
- 3.12 Below mentioned measuring instruments in adequate number should be available –
  - a. Micrometers
  - b. Dial gauges
  - c. Vernier calipers
  - d. Go – No-Go gauges for all the important dimensions for a specific product
- 3.13 Minimum one number chemical balance and a crucible for measuring ash content should also be available
- 3.14 Compression set testing apparatus in accordance with para 4.1 of IS 3400 Part X should be available.
- 3.15 Minimum two sets suitable fixtures for compression load deflection test as per the drawings specified in the relevant specification of product should be available.
- 3.16 Ensure that a suitable fixture for additional test which is done in accordance with IS 3400 Part XIV is available. The fixture for shear bond test should also be available.
- 3.17 Ensure that the following additional fixtures in accordance with the specification and drawings are available-

- a. Fixture for shear load deflection.
- b. Fixture for Bond Test.

3.18 The Hydraulic Shear Fatigue Testing Machine should be available. The shear fatigue testing machine should satisfy the following requirements-

- It should be able to apply the fatigue load as per the stipulated specification.
- It should be possible to read the load applied as well as the number of cycles directly on the machine.
- Provision should be there to ensure that the loading cycles are sinusoidal.
- Computerised system exist to take out the graph for loading cycle of the pad
- The machine should be capable to control initial load hydraulically & not by clamping the pad
- The pad should take the entire load of the cyclic loading. Load shearing should not be there by clamps/bolts

3.19 Suitable facilities for cutting the test specimen from the product should be available.

**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 the system of 'First in –First out' is followed for raw material and the intermediate stage product.

4.3 Ensure that there is a Quality Assurance Plan for the product detailing various aspects –

- Organisational chart
- Flow process chart
- Stage inspection details
- Various parameters and to ensure control over them

The QAP shall be available as per the requirements detailed in "Vendor approval guidelines & application form" –IL-03: 2000

4.4 There should be at least one full time rubber technologist having a minimum bachelor's degree in relevant field with 5 years experience or a person with diploma in relevant field with 12 years experience. He should be free from day-to-day production, testing & 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.

4.5 Ensure that the in-charge of the Quality Control Section is having a qualification of minimum bachelor's degree in the relevant field & have min

5 years experience or a diploma holder with min 12 years experience. He should be actively involved in day-to-day activities of quality control / stage inspection / compliance of QAP etc.

- 4.6 The firm should have acquired ISO:9000 series certification and the product for which an approval is sought should be broadly covered in the scope of the certification for manufacture & supply.
- 4.7 The Quality manual of the firm for ISO:9000 should clearly indicate at any stage the control over manufacturing and testing of the said railway product.
- 4.8 Ensure that proper analysis is being done on monthly basis to study the rejection at various internal stages and it is documented.
- 4.9 Ensure that all the relevant specifications, IS standards are available with the firm.
- 4.10 Ensure that the customer earmarks adequate covered area for storage of final product, awaiting inspection.
- 4.11 Ensure that proper record of complaints received from users(Railways) is being maintained & corrective action is taken.