

GOVERNMENT OF INDIA  
(Ministry of Railways)

SPECIFICATION FOR  
MAGNAGLO POWDER FOR  
WHEEL INSPECTION  
(PL No. 81980103)

Issued by

MECHANICAL DRAWING OFFICE  
RAIL WHEEL FACTORY  
YELAHANKA, BANGALORE-560 064  
I N D I A

<i>M. S. S. 6/7/04</i>	<i>W. P. 6/7/04</i>	<i>N. S. 6/7/04</i>	<i>R. S. 6/7/04</i>
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

**SPECIFICATION FOR MAGNAGLO POWDER FOR WHEEL INSPECTION**

1.0 **Scope:**

The specification covers supply of "Magnaglo Powder" for Magnaglo equipment, which will be supplied at Rail Wheel Factory, Yelahanka, Bangalore, Karnataka State India as per the instructions and conditions of contract and tender papers.

2.0 **General Description:**

Magnaglo powder is a dry, free flowing, speckled brown and white magnetic powder which is fluorescent and bright yellow-green under black light (wave length of 365 nanometres).

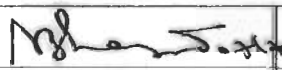
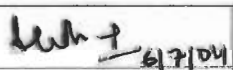
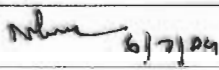

3.0 **Job Requirement:**

3.1 Magnaglo powder is intended for use in high sensitivity wet method magnetic particle inspection using water as suspension vehicle. At RWF, it is used to locate fine surface and sub-surface discontinuities such as cracks, inclusions, seams, shrinkage porosity, tears, laps, flakes etc., in cast steel wheels for rail-road application.

3.2 The Magnaglo inspection (magnetic particle inspection) is carried out on all the wheels manufactured at RWF as per AAR M 107/208 specification.

3.3 The Magnaglo powder shall be used for the above inspection of wheels using magnetic particle inspection equipment type C-1464C manufactured and erected by M/s Magnaflux Corporation, USA or similar. The magnetic boom is having 1800 ampere turns AC winding capable of inspecting variable diameter of cast steel wheel ranging from 730 to 1100mm.

3.4 The chemistry of cast steel wheel is medium carbon steel or micro alloyed steel with carbon content ranging from 0.45 to 0.70%.

			
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

4.0 **Technical Requirements:**

4.1 Magnaglo powder shall contain conditioning agents, which improve the magnetic particle suspendability and mobility, impart surface wetting and nominal corrosion inhibition.

4.2 The fluorescent colour shall contrast sharply with background of cast steel wheel surface when viewed under black light inspection.

4.3 The Magnaglo powder shall be coated with fluorescent pigment and have non-ionic surfactant and corrosion inhibitors without any free fluorescent pigment. The conditioning and suspending agents shall not give any odour or smell in the spray tank under agitation or mixing of the bath.

4.4 **Performance Test:**

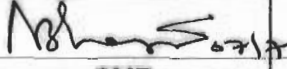
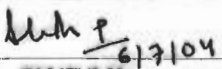
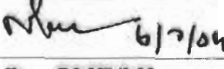
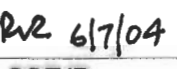
The material is tested on new cast steel wheels continuously in 3 shifts, each of 8 hours' duration, to assess the following parameters.

1. Crack detectability within 2 rotations of the wheel under test commencing from magnetisation
2. Background fluorescence
3. Detectability of inclusion based subsurface defects
4. Consumption pattern
5. Settling test

The above tests shall be carried out as per the recommended concentration suggested by the supplier.

4.5 The powder shall rapidly disperse through out when it is directly added to the tank containing water and shall not cause any foaming on the surface of the tank when it is continuously agitated.

4.6 The bath concentration of Magnaglo powder in water shall be specified by the manufacturer.

			
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED


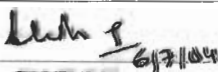

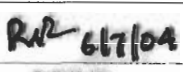
5.0 **Typical Properties:**

- (a) Colour under white light: Brown or greenish black
- (b) Colour under black light: Yellowish Green Fluorescence
- (c) Mean particle size : 6 microns
- (d) SAE sensitivity : 8-9 (Ketos Ring indication)
- (e) Settling volume (30 min/100 ml) : 0.20 ml minimum
- (f) P<sup>H</sup> Value : 9.0(1% water)+/-0.5
- (g) Chlorine : 0.01% max.

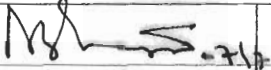
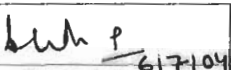
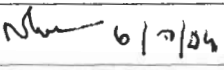
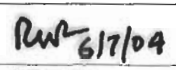
6.0 **Acceptance Criteria:**

6.1 **A. Field Trials:**

6.1.1 11.25 gram/litre of water (current practice followed at RWF) or as recommended by the manufacturer such that it meets settling tests as indicated at 5.0(e) under typical properties. A requisite quantity of Magnaglo powder is charged to a 'V' shaped tank of capacity 40 litres having a motorised stirrer. The solution is pumped and sprayed through a nozzle to enable magnetic particle inspection of cast steel wheels. The spray solution should give good background (golden yellow) on cast steel wheel and the inspector shall be able to decipher surface, subsurface cracks, inclusions etc., easily. The rotational speed of the cast steel wheel during test shall be 4 to 6 RPM for BOX N wheels (1007mm dia.). For lesser dia. Wheels, the RPM shall be proportionately higher.

			
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

- 6.1.2 Natural cracks of any type and orientations ranging from clusters to long cracks shall be revealed at any part of the wheel under black lights. The minimum intensity should be 525 microwatts per square centimetre as measured at a distance of 381mm (15") from the source of the light.
- 6.1.3 Under the above procedure, cracks shall be revealed clearly on cast steel wheel within two rotations commencing from magnetisation. This requirement is essential for meeting the overall cycle time of wheel production.
- 6.2 **B. Loose pigment test:**
- 6.2.1 Test is conducted to check the durability and consistent contrast of magnetic particles. Prepare 250ml solution of the test sample in 500 ml beaker with distilled water and the dosage/concentration as recommended by the manufacturer. Stir gently with glass rod for 5 minutes to obtain uniform mixing and further in the laboratory stirrer for 5 minutes at a uniform speed without varying intermittently.
- 6.2.2 After the stirring, place the beaker on powerful magnet for instant settling of magnetic particles. Observe the liquid portion of the slurry for loose pigments under UV light after five minutes.
- 6.2.3 Magnetic particles should settle faster on the bottom of the beaker and having original fluorescence. The sensitivity and contrast will indicate the quality of powder.
- 6.2.4 The solution shall be clear and shall not show milkiness or fluorescence when observed under black light.

			
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

6.2.5 The above solution, vide cl. 6.2.4, when checked after 30 minutes in spectro photometer for transmission, shall have a minimum of 70% transmission. The reference standard for transmission test shall be distilled water with 100% transmission. The wavelength of spectro photometer shall be set at 640 nm.

6.3 **Colour:**

6.3.1 The Magnaglo powder is observed under white light. The colour shall be brown or greenish black.


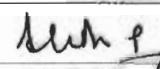
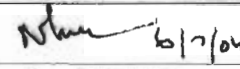
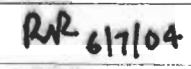
6.3.2 The Magnaglo powder sample is kept under 100W UV lamp and the colour is observed. The colour of the powder under UV light shall be yellowish green fluorescence.

6.4 **Determination of p<sup>H</sup> value:**

6.4.1 Prepare 1% solution of the Magnaglo powder in distilled water in a 500ml beaker. Stir for 5 minutes to obtain uniform concentration and check the p<sup>H</sup> of the solution by using digital p<sup>H</sup> meter. The p<sup>H</sup> value shall be 9.0 +/-0.5.

7.0 **Packing and marking:**

Material should be supplied in fully sealed plastic jar of 20 kg capacity. Each container should be marked legibly with manufacturer's name, date of manufacturing, batch number, expiry date and dosage.

			
CME	CWE/Mfg. 6/7/04	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

8.0 **Sampling Norms:**

8.1 Consignments of this material are usually supplied in fully sealed plastic jars of 20 kg capacity. The number of jars as sample shall be selected at random as per the table given below.

Lot weight selected	No. of 20 kg jars to be sampled (fully sealed)
Up to 100 kg	01
Over 100kg and less than/ equal to 400 kg	02
Over 400 kg including 1,000 kg.	04

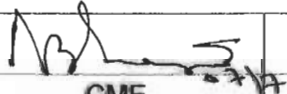
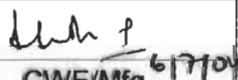
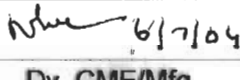
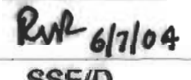
From each lot indicated in the above table, with the help of suitable sampling instrument, 2kg of material shall be taken. Sample drawn from each selected container, shall be mixed to form a composite sample. By successive cone and quartering division method, the composite sample shall be reduced to give a final test sample of 500 grams for the practical test and other specified parameters.

9.0 **Test certificate:**

Test certificate indicating the dosage typical properties mentioned in clause 5.0 should accompany the lot/batch.

10.0 **Shelf Life:**

The Magnaglo Powder should possess a shelf life period of 2 years from the date of supply to RWF.

			
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED

**AMENDMENT SHEET**

Alt	Date	Clause No.	Description	Job No.	Sign
f	06-07-2004		<b>Revised and redrafted.</b>	4583	<i>Shree</i> 6/7/04
		5.0(f)	Tolerance to p <sup>H</sup> value +/-0.5 <b>added</b>		
		6.3	Clauses 6.3 on Colour <b>added</b>		
		6.4	Clause 6.4 on Determination of p <sup>H</sup> value <b>added</b>		

<i>Shree</i> 27/7	<i>Shree</i> 6/7/04	<i>Shree</i> 6/7/04	<i>RVC</i> 6/7/04
CME	CWE/Mfg.	Dy. CME/Mfg.	SSE/D
APPROVED	REVIEWED	VERIFIED	PREPARED