



TECHNOLOGY MANAGEMENT WHEELSET AND MATERIALS TECHNOLOGY SPECIFICATION

LOCOMOTIVE ADHESION MEDIA PERFORMANCE SPECIFICATION

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TABLE OF CONTENTS

1.0	SCOPE	3
2.0	REFERENCES	3
3.0	DEFINITIONS AND TERMINOLOGY	3
4.0	TYPE OF ADHESION MEDIA SUPPLIED	4
5.0	ADHESION MEDIA PROPERTIES	4
6.0	FLOW RATE PERFORMANCE	4
7.0	CHEMICAL AND MECHANICAL PROPERTIES	5
8.0	HEALTH AND ENVIRONMENTAL PROPERTIES	6
9.0	CONFORMANCE TO SPECIFICATION	6
10.0	REVISION HISTORY	6

LIST OF TABLES

Table 1: Locomotive flow rates requirements	4
Table 2: Mechanical Properties of adhesion media	5
Table 3: Chemical properties of adhesion media	5
Table 4: Hazardous chemical substances	5
Table 5: Revision History	6

1.0 SCOPE

- 1.1 This specification covers the performance properties required of adhesion media used on locomotive sanding equipment for enhancing wheel adhesion to the rail.
- 1.2 The specification covers adhesion media as supplied to locomotive depots in bulk as well as adhesion media supplied in appropriate size waterproof bags.

2.0 REFERENCES

- 2.1 Rail and Safety Standards Board: *ERTMS adhesion management: An assessment of the available adhesion and slip risk for ERTMS*
- 2.2 Rail Research UK: *New Rail Materials and Coatings, report RRUk/A2/1 by G. Vasic, F.J. Franklin and A. Kapoor*
- 2.3 White Rose Research Online: *Twin Disc Assessment of Wheel/Rail Adhesion by E.A. Gallardo-Hernandez, R. Lewis*
- 2.4 Occupational Safety and Health Administration (OSHA): *Health Effects of Hexavalent Chromium; Dangers of Hexavalent Chromium; Crystalline Silica Exposure Health Hazard Information*
- 2.5 Association for the American Railroads (AAR), Section M-916

3.0 DEFINITIONS AND TERMINOLOGY

- 3.1 The Supplier - the successful supplier and/or manufacturer of the adhesion media for use on Transnet locomotives
- 3.2 QA Department - the section in which all quality inspection of incoming purchased material is evaluated
- 3.3 Adhesion - it is a term that describes the condition of friction between the wheel and the rail when rolling and sliding occur. It is measure of the grip that occurs between the wheel and the rail.
- 3.4 Tractive Effort (TE) - it is the pull force that a locomotive is able to generate in order to move a train (locomotive and wagons).
- 3.5 Braking Effort - it is the retarding force in which a locomotive is able to generate in order to decelerate a train.
- 3.6 Material Safety Data Sheet (MSDS) – the product sheet containing information regarding safe handling, health and environmental effects and control measures

4.0 TYPE OF ADHESION MEDIA SUPPLIED

- 4.1 The adhesion media supplied may be sand, mineral slag or ceramic.
- 4.2 The adhesion media may be supplied in waterproof bags of 5, 10, 20, 25, and 50 Kg or in bulk bags as required by the depot. The supplier/manufacturer name and the adhesion media grade shall be clearly visible on the packaging.
- 4.3 The adhesion media when it is supplied shall be in a dry and ready to use condition (free of pebbles, leaves and foreign particles).

5.0 ADHESION MEDIA PROPERTIES

- 5.1 When in operation the adhesion media shall be able to provide the minimum and/or improve the tractive and braking effort for all locomotives as specified by Transnet requirements (documents PD_PEL_NAT_MAN_001).
- 5.2 The adhesion media must be able to improve adhesion between the wheel and the rail during traction and braking when operating under the following conditions:
- Adverse weather conditions (humidity, light rain and snow) and
 - Contamination of the rail (light rust, grease and oil, salt and industrial fall-out, leaves)
- 5.3 The abrasion properties of the adhesion media shall not cause accelerated wear on the wheel and rail surfaces when in operation.
- 5.4 Under operating conditions, the adhesive media shall not affect the track circuit operation.

6.0 FLOW RATE PERFORMANCE

- 6.1 The adhesion media as supplied shall be able to conform to the flow rates required as specified in Table 1 below. Please note that the sand nozzle heads of each locomotive class has already been adjusted.

Table 1: Locomotive flow rates requirements

Electric Locomotive class/ series	Flow rate
7E	800 - 1000 ml/min
18E and 6E	700 - 800 ml/min
11E	400 - 450 ml/min
19E	250 ml/min
9E	250 ml/min
10E	700 ml/min
14E	700 ml/min
15E	700 ml/min
Diesel Electric Locomotive class/series	Flow rate
D34 (GE and GM)	250 - 300 ml/min

D37 (GM)	220 - 300 ml/min
D39-200 (EMD)	300 - 350 ml/min
D43 (GE)	180 - 250 ml/min
D35, D38, D36	350 ml/min

6.2 Generally the adhesive medium shall be able have a flow rate range of 180-1000 ml/min for any given class locomotive application.

6.3 When the adhesion media comes in contact with moisture, the caking properties shall be such that the sand box pipe does not become clogged and or difficult to clean.

7.0 CHEMICAL AND MECHANICAL PROPERTIES

7.1 The adhesion media shall have the mechanical properties as specified in Table 2 below.

Table 2: Mechanical Properties of adhesion media

PROPERTY	
Grain size (mm)	0.20 - 2.00
Profile range (micron)	70-110
Hardness (Moh Scale)	6.00 - 7.00
Specific weight (g/cm ³)	3.5 maximum

7.2 The chemical properties shall conform to the requirements as specified in Table 3 below.

Table 3: Chemical properties of adhesion media

PROPERTY	
Moisture content	0 - 0.2%
PH value	8

7.3. Table 4 below list the acceptable tolerances for the hazardous chemical substances that can be present in the adhesion media. All adhesion media shall conform to the requirements as specified in Table 4 below.

Table 4: Hazardous chemical substances

ELEMENT /COMPOUND	
Hexavalent chromium (Cr ⁶⁺)	<2% by volume and < 10mg/Kg
Cadmium	No traces
Crystalline Silica / Free Silica	No traces

7.4. There should be no contamination (clay, grave, loam and other foreign material) present in the adhesion media.

7.5 The adhesion media must be chemically stable, with zero to low levels of reactions when exposed to unsuitable environments.

7.6 The adhesion media as supplied shall be odourless.

8.0 HEALTH AND ENVIRONMENTAL PROPERTIES

8.1 The adhesion media supplied should pose no health risk in terms of silicosis, lung cancer, allergic contact dermatitis, etc.

8.2 The adhesion media when mixed with the environment, no harmful biological effects should occur.

8.3 The supplier shall provide the MSDS of the adhesion media. The MSDS shall clearly state all the health and environmental dangers, toxicology information, handling and storage procedures, accidents and spillage control measures, stability and reactivity of the adhesion media.

9.0 CONFORMANCE TO SPECIFICATION

9.1 All adhesion media supplied shall conform to the minimum requirements specified within this specification. Should the adhesion media delivered not conform to the requirements and/or is not equivalent to the tender sample, it shall be rejected.

9.2 All adhesion media supplied shall be tested for conformance to specification in terms of tractive effort and flow rate by Transnet. The supplier shall provide all information with regards to chemical, mechanical, health and environmental properties of the adhesion media.

10.0 REVISION HISTORY

Table 5: Revision History

Revision date	Revision number	Details of changes
13 July 2013	00	Original document
02 June 2014	01	Note added 7.3.3: "The adhesion medium should not contain any particles or traces of cadmium and its oxides" added 10.0: Revision History and Table 4
06 May 2017	02	4.2 was amended to include the 25 and 50kg package size 7.3 was amended to indicate the acceptable tolerances for hazardous chemical substances, See Table 4 10.00 the revision history table was renumbered to Table 5