



**WATER BASED PAINT PURCHASE SPECIFICATION FOR TRANSNET'S
ROLLING STOCK**

SPECIFICATION NUMBER

Valid for 4 weeks from 2015-11-24 12:44:40+0200

RS/ME/SP/009

Rev 08

Doc Name: Paint Purchase Specification For
Transnet's Rolling Stock.

Doc No: **RS/ME/SP/009**

Classification: Internal & External use

Revision: 08

Date Issued: 26th June 2015

1.

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Valid for 4 weeks from 2023-11-24T12:44:40+0200

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PART 1.

PAINT PERFORMANCE SPECIFICATION FOR TRANSNET'S ROLLING STOCK

1.0 PURPOSE

The purpose of this specification is to convey the performance requirements for a water based paint system to be used by Transnet Rail Engineering for the painting of rolling stock i.e. locomotives, mainline coaches and freight wagons, as to allow the paint manufactures to formulate the optimum coating which will meet the need of Transnet Rail Engineering and its Contractors as outlined in this specification.

2.0 SCOPE

This specification covers all the requirements for paints used on the rolling stock of Transnet Freight Rail from the formulation of the paint, manufacture, storage, application and the entire service life of the paint system. Furthermore the commitment and partnership between Supplier, Transnet and its Contractors by which the technical pool of expertise of the paint supplier is effectively applied ensuring the best possible service out of the paint system.

3.0 COLOURS REQUIRED

The following are the colours of the final coats of paint which are required.

COLOUR	SPECIFICATION	USED
Graphite Grey	RAL 7024	Locos, Coaches & Wagons
Light Grey	RAL 7035	Locos, Coaches & Wagons
Traffic White	RAL 9016	Locos, Coaches & Wagons
Transnet Red	NCS S 1085-Y90R	Locos
Transnet Green	NCS S 4040-G70Y	Locos
Transnet Yellow	NCS S 1070-Y20R	Locos
Coach Yellow	RAL 075 70 60	Locos, Coaches & Wagons
Coach Turquoise	RAL 200 50 45	Coaches
Coach Purple	RAL 320 30 35	Coaches

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Violet	B7-C-14	Locomotives
Plascothane Pure Orange	UP-7	Locomotives
French Grey	H30	Locomotives & Wagons
Pebble Grey	RAL 7032	Locomotives
Light Brown	G379	Locomotives
Aqua Marine Blue	RAL 5002	Locomotives, Coaches
Blue Green	RAL 6004	Locomotives
Water Blue	RAL 5021	Locomotives, Coaches
TE Light Brown Velvaglo	TVW 2000	Locomotive Drivers Cab
French Grey	TWI 2000	Locomotive Engine Compartment

4.0 DELIVERY POINTS

The paint will be mostly applied at the six Transnet Rail Engineering workshops through out South Africa. The sites are in:

Pretoria

Germiston **Valid for 4 weeks from 2023-11-24T12:44:40+0200**

Bloemfontein

Durban

Cape Town

Uitenhage

5.0 DEVELOPMENT PROCESS

5.1 Formulation

Tenders must acquaint themselves with the conditions at all Transnet Rail Engineering's factories and take cognisance of these facts when formulating a suitable paint system for rolling stock. Under no circumstances will the supply of paint covered by the guarantee become subject to Transnet Rail Engineering changing the facilities other than agreed upon prior to the awarding of the contract.

The manufacturer must then formulate the optimum paint system which will serve the requirements as per specification. This sample paint must be submitted to an

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independent paint chemical laboratory for testing in accordance with the respective Part specification of specification RS/ME/SP/009 and the results submitted to Transnet. A further sample of the proposed paint system must be supplied for in service field tests on a complete wagon, mainline coach, electric locomotive and diesel locomotive. These test samples must be supplied free of charge.

The supplier must provide data sheets, storage and application specifications for the proposed paint system.

The supplier must recommend suitable dent filler, in accordance with Part-3 of this specification, which must be compatible with his proposed paint system.

The Blue Train, mainline coaches and locomotives are washed on a regular basis. The supplier of the paint must recommend a detergent and a cleaning procedure which will allow the surface to be effectively cleaned while not damaging the paint system.

Once approved, the formulation of the paint system will be frozen. The supplier must then be obliged to produce the paint as submitted as per the sample supplied.

It is expected of the supplier to continually update the formulation in order to keep abreast with the latest technological developments. These updates to the product will be implemented as discussed under the heading "Deviations".

6.0 DEVIATIONS

Should any changes be made to the formulation of the paint system supplied, this has first to be approved by Transnet Rail Engineering. All discussions regarding deviations and concessions must be done in writing. The postal address is:

Transnet Rail Engineering

P.O. Box 15912

Lynne East

Pretoria

0039

No deviations which have not been approved through this route will be allowed.

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7.0 WARRANTY

The supplier must be prepared to offer at least a three year warranty on his product which must cover coating failure whether such failure is a result of lack of adhesion, chalking, pinholes, cracking, colour change, wear down as a result of washing, UV exposure or rusting.

The warranty is contingent upon the supplier implementing a surveillance system over the surface preparation, mixing of products and application of coating.

8.0 MANUFACTURE

A quality system which is equivalent to ISO 9000 series must be operative which will prove the ability of the manufacturer to eliminate variations between batches.

Control documentation per batch must be delivered together with the paint supplied.

The manufacture must have the necessary contingencies in place to ensure continuity of quality and delivery during industrial action, material shortage, loss of key personnel, etc.

9.0 STORAGE

The paint will be stored in stores without temperature control. It is imperative that the paint shall be serviceable even if it has been exposed to temperatures of -5°C to +40°C. The minimum shelf life of the paint supplied must be 12 months from date of delivery. (Not date of manufacture).

10.0 APPLICATION

The most stringent application parameters acceptable to Transnet are listed below. Any alleviation in these parameters will be preferred:

Relative humidity.	0 % min., 80% max.
Ambient temperature.	8°C - 38°C

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Surface temperature.	3°C above dew point.
Surface cleanliness.	Sa 2½ (ISO 8501-1)
Surface profile height.	40µm - 60µm

11.0 SERVICE LIFE

The paint system will be applied to steel surfaces of the rolling stock of Transnet Freight Rail. In some instances the substrate will be blast cleaned and in other the existing paint system will only be sanded. These existing paint systems could be a Polyurethane Acrylic system or a Water Based system. The paint system will be exposed to continual UV radiation, ambient temperature variations from -10°C to +45°C, coastal and inland atmosphere, mineral and metallic dust and physical damage.

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PART 2.

SPECIFICATION FOR SHOP & TRAVEL PRIMER

1.0 SCOPE

This specification covers the requirements for a pure acrylic water based shop & travel primer coating for the protection of Transnet's rolling stock. The primer is formulated specifically for hydraulic spray application to rolling stock and rolling stock components. It forms the shop & travel primer of the rolling stock paint system followed by primer coating, emulsion, high build rust inhibitive conforming to Part - 3 of this specification.

The primer must be applied at ambient and surface temperatures between 5° C and 38° C, when the dew point is at least 5° C less than the surface temperature and at relative humidity of up to 80 %, and when the dew point is at most 22 ° C less than the ambient surface temperature at a relative humidity of down to 0 %.

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2.0 COMPOSITION

The primer must be a single pack pure acrylic dispersion type, containing non-toxic rust inhibitive pigments. The primer must be supplied ready for use by airless application and must be formulated to be flash rust resistant. It must comply with the performance requirements which are specified below when applied at a minimum dry film thickness of 15 micrometers over metal surfaces cleaned and treated in accordance with Part -8 of this specification.

2.1 Binder.

The binder shall be a pure acrylic dispersion with less than 1% free monomers and must have not less than 42% solids by weight.

2.2 Pigment.

The pigment must consist of recognised rust Inhibitive pigments together with the necessary inert fillers, tinting pigments and anti-settling agents.

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2.3 Toxicity.

The primer must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following:-

- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols
- Shall contain no Chloro iso thymol

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3.0 QUANTATIVE REQUIREMENTS

The primer must conform to the requirements of Table 1.

Table 1 - Quantitative Requirements

CLAUSE	PROPERTY	UNIT	LIMITS		TEST METHOD
			min	max.	
3.1	Volume solids	%	35	-	ASTM D2697
3.2	Fineness of grind	μ	-	15	SABS ISO 1524
3.3	Drying time : Surface	h	-	0,5	5.1 hereof
	: Dry to handle	h	-	1	
	: Hard Dry	h	-	2	
3.4	Recoating time	h	-	2	5.2 hereof
3.5	pH		4,5	10	Potentiometric
3.6	Resistance to impact (direct)	J	5,0	-	5.3 hereof
3.7	Pinholes		Pinhole system	free	5.13 hereof
3.8	Min. film forming temp.	°C	3	-	5.14 hereof

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4.0 QUALITATIVE REQUIREMENTS

The primer must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
4.1	Condition in container	5.12 hereof
4.2	Storage stability 12 months from delivery date	Supplier to certify date of delivery on batch release certificate.
4.3	Spraying properties	5.4 hereof
4.4	Appearance	5.5 hereof
4.5	Sagging	5.6 hereof
4.6	Intercoat adhesion	5.7 hereof
4.7	Adhesion : i) To abraded steel ii) To weathered Emulsion & Polyurethane Acrylic system	5.8 hereof
4.8	Resistance to salt fog : Primer 100 hours	5.9 hereof
4.9	Flexibility (3 mm mandrill)	5.10 hereof
4.10	Freeze-thaw stability	SABS 1586-1995
4.11	Colour: The colour of the primer must be a commercial match to red oxide according to A05 of SABS 1091-1975.	
4.12	Resistance to flash rusting	5.11 hereof

5.0 METHODS OF TESTING.

5.1 Drying time.

Follow test method according to SABS Method 148 with a mass of 4500 g.

Use a doctor blade to apply one coat at a wet film thickness of 70 - 80 micrometers. The film must be hard dry within 2 hours when tested

5.2 Recoating time.

When spray applied at a wet film thickness of 70 - 80 micrometer and allowed to dry for 1 hour according to SABS ISO 3270, the primer must be capable of being recoated with it self by hydraulic spray without development of any film defects after 1, 5 hours drying according to SABS ISO 3270.

5.3 Resistance to impact.

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Follow the procedure outlined in SABS Method 146. Apply the primer, using a doctor blade, at a wet film thickness of 70 - 80 micrometer. Age the panels for 7 days under standard conditions (SABS ISO 3270) before conducting the test with the painted side of the panel facing the plunger.

5.4 Spraying properties.

Follow test method in accordance with SANS 5044 / SABS 44 and apply the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment. An 020" adjustable tip must be used.

5.5 Appearance.

Spray apply a coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment with an 020" adjustable spray tip, to steel panels cleaned and surface prepared in accordance with Part - 8 of this specification. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

5.6 Sagging. Valid for 4 weeks from 2023-11-24T12:44:40+0200

5.6.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) by airless equipment a coat of primer to a wet film of 70 - 80 micrometers. Place the panel in a vertical position along its long edge and allow the primer to dry according to SABS ISO 3270, for two hours.

5.6.2 Criteria.

To pass this test, the paint must not sag. (A thick edge at the bottom of the panel is not considered as sag).

5.7 Intercoat adhesion.

5.7.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper.

5.7.2 Procedure.

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Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to a test panel. A tip size of 0,020" must be used. Age the panel for 7 days under standard conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same primer to the panel as well as to a bare control panel. Again age for 7 days. Examine the panel for film defects and compare with the control panel.

Conduct the test on the test panel in accordance with specification SANS 2409.

5.7.3 Criteria.

There must be no difference in appearance between the two panels and the test panel must not show any signs of film defects such as blistering, wrinkling or loss of adhesion.

5.8 Adhesion.

5.8.1 Abraded steel.

5.8.1.1 Procedure.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper. Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to the test panel., the tip size must be a 0,020 spray tip and age for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

5.8.1.2 Criteria.

There must be no loss of adhesion between the primer and the steel.

5.8.2 Weathered Emulsion and Polyurethane systems.

5.8.2.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514.

- One coat paint Emulsion, Semi Gloss in accordance with Part 5 of this specification.

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- One coat Paint Polyurethane water based high gloss in accordance with Part 6 of this specification.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows :-

- 4 hours at 60°C UV and 4 hours at 40°C condensation cycle.

5.8.2.2 Procedure.

Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to the test panel. A tip size of 0,020” must be used. Age the panels for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409. Examine for loss of intercoat adhesion between the two surfaces and compare the appearance with that of the control panel.

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5.8.2.3 Criteria.

There must be no loss of adhesion between the primer and the weathered coating system.

5.9 Resistance to salt fog.

5.9.1 Test panels.

Use four cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

5.9.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 micrometers.

5.9.3 Painting of panels.

Spray apply two coats of the unthinned primer to a wet film thickness of 70 - 80 micrometers each using suitable hydraulic spray equipment. A tip size of 0,020” must be used. Allow the first coat to dry for 2 hours before applying the second

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coat. Age the panels for 7 days at 23^o C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means. Prepare two additional panels as above but overcoat them after 24 hours by spraying with one coat of the same manufacturer's finishing paints complying with Parts – 5 & 6 of this specification to a wet film thickness of 140 - 150 micrometers for Part 5 and 80 – 100 micronmetres for Part 6 of this specification.

5.9.4 Procedure.

Ensure that the dry film thickness of the test panels is between 15 and 30 micrometers for the primed steel panels and between 80 and 100 micrometers for the complete system. Using a sharp knife, diagonally score the panels through to bare substrate from all four corners. Expose the panels in a salt fog cabinet according to SABS ISO 1519 for the respective specified periods.

5.9.5 Criteria.

For the primer and complete paint system to pass this test, there must be no signs of rust except in the scribed lines. There must be no blistering or any other film defects and no rust creep or loss of adhesion more than 2 mm average, on either side of the scribe lines of both the primed and complete paint system panels.

5.10 Flexibility.

Follow the procedure outlined in SABS ISO 1519. Apply the primer with a doctor blade having a clearance to obtain a dry film thickness of 20 micrometers. Let the primer dry for 24 hours at standard conditions (SABS ISO 3270) and stove for 24 hours in an oven at 90^o C ± 2^o C. Cool to room temperature within 15 minutes before conducting the test using a 3 mm mandrel.

5.10.1 Criteria.

For the primer to pass, no defects must be present.

5.11 Resistance to flash rusting.

5.11.1 Panels.

Use three clean mild steel panels 300 mm X 300 mm X 2 mm. Abrasive blast clean the panels to cleanliness of Sa 2½ in accordance with ISO 8501-01 with a maximum blast profile of 60 micrometers. Apply a coat of primer to the newly cleaned panels to a dry film thickness of 30 microns).

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5.11.2 Exposure.

Expose the first panel under standard conditions in a constant temperature room (SABS ISO 3270) for 1 hour. Expose the second panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 38° C for 1 hour. Expose the third panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 8° C for 1 hour. Remove the panels and examine for any visible signs of flash rusting.

5.11.3 Criteria.

No evidence of flash rusting must be visible on either of the painted panels.

5.12 Condition in container.

In addition to the requirements of SABS Method 1524, the primer must be supplied ready for use in the containers without the need for straining to remove skins or coarse particles.

5.13 Pin holes.

5.13.1 Procedure.

Prepare test panels according to clauses 5.9.1 to 5.9.3 of this specification. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

5.13.2 Criteria.

The complete paint system must be pinhole free.

5.14 Minimum film forming temperature (MFT).

5.14.1 Follow the test method as described in ASTM 2354.

5.14.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening / cracking or both.

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Annex No. 1 to Part - 2 of Specification RS/ME/SP/009

Product Qualification Certificate.

Primer Coating, Shop & Travel Primer

Tenderer : _____ Certificate No. : _____

Manufacture: _____

Name of Material: _____

1. COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			

2. QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
2.1	Non-volatile content	% m/m			
2.2	Volume solids	%			
2.3	Fineness of grind	µm			
2.4	Drying Time: i) Surface ii) : Dry to handle iii) : Hard Dry	h h h			
2.5	Recoating time	h			
2.6	pH				
2.7	Resistance to impact (direct)	J			
2.8	Mass per litre	g			
2.9	Consistency	g			

3. QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance	
3.5	Sagging	
3.6	Inter coat adhesion	
3.7	Adhesion i) ii)	

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CLAUSE	PROPERTY	REMARKS
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour	
3.11	Resistance to salt fog : i) Primer, 100 hrs ii) System, 500 hrs	
3.12	Resistance to flash rusting	

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

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Signed: _____

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Annex No. 2 to Part - 2 of Specification RS/ME/SP/009

Batch control test certificate.

SHOP & TRAVEL PRIMER

Manufacturer: _____

Name of material: _____ **Batch No.:** _____

1. QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Non-volatile content	% m/m	
1.2	Volume solids	%	
1.3	Fineness of grind	µm	
1.4	Drying time : i) Surface ii) Hard	h h	
1.5	Recoating time	h	
1.6	pH		
1.7	Mass per litre	g	
1.8	Consistency	g	

2. QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance	
2.4	Sagging	
2.5	Colour	
2.6	Resistance to flash rusting	

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PART 3.

SPECIFICATION FOR PRIMER COATING, EMULSION, HIGH BUILD, RUST INHIBITIVE

1.0 SCOPE

This specification covers the requirements for a water based primer coating for the exterior protection of Transnet's rolling stock. The primer is to be formulated specifically for hydraulic spray application to the exterior metal cladding of rail vehicles. It forms the base of the rolling stock paint system followed by Paint, Emulsion, Semi-Gloss conforming to Part – 6 and Two Pack Polyurethane, Water Based conforming to Part – 7 of this specification. The primer will be applied at ambient and surface temperatures between 8° C and 38° C, when the dew point is at least 5° C less than the surface temperature and at relative humidity of up to 80 %, and when the dew point is at most 22 ° C less than the ambient surface temperature at a relative humidity of down to 0 %.

2.0 COMPOSITION

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The primer must be a one pack acrylic dispersion type, containing non-toxic rust inhibitive pigments. The primer must be supplied ready for use and must be formulated to be flash rust resistant. It must comply with the performance requirements which are specified below when applied at a minimum dry film thickness of 50 micrometers over metal surfaces cleaned and treated in accordance with Part -8 of this specification.

2.1 Binder

The binder shall be an acrylic dispersion with less than 1% free monomers and must have not less than 42% solids by weight.

2.2 Pigment

The pigment must consist of recognised rust Inhibitive pigments together with the necessary inert fillers, tinting pigments and anti-settling agents.

2.3 Toxicity

The primer must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following:-

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- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols
- Shall contain no Chloro iso thymol

3.0 QUANTITATIVE REQUIREMENTS

The primer must conform to the requirements of Table 1.

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Table 1 - Quantitative Requirements

CLAUSE	PROPERTY	UNIT	LIMITS		TEST METHOD
			min	max.	
3.1	Volume solids	%	35	-	ASTM D2697
3.2	Fineness of grind	μ	-	25	SABS ISO 1524
3.3	Drying time : Surface	h	-	0,5	5.1 hereof
	: Dry to handle	h	-	1	
	: Hard	h	-	2	
3.4	Recoating time	h	-	1,5	5.2 hereof
3.5	pH		4,5	10	Potentiometric
3.6	Resistance to impact (direct)	J	5,0	-	5.3 hereof
3.7	Pinholes		Pinhole system	free	5.13 hereof
3.8	Min. film forming temp.	°C	3	-	5.14 hereof

4.0 QUALITATIVE REQUIREMENTS

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The primer must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
4.1	Condition in container	5.12 hereof
4.2	Storage stability (12 months from delivery date)	Supplier to certify date of delivery on batch release certificate
4.3	Spraying properties	5.4 hereof
4.4	Appearance	5.5 hereof
4.5	Sagging	5.6 hereof
4.6	Intercoat adhesion	5.7 hereof
4.7	Adhesion : i) To abraded steel ii) To weathered emulsion / polyurethane acrylic system	5.8 hereof
4.8	Resistance to salt fog : i) Primer 200 hours ii) System 500 hours	5.9 hereof
4.9	Flexibility (5 mm mandrill)	5.10 hereof
4.10	Freeze-thaw stability	SABS 1586-1995
4.11	Colour: The colour of the primer must be different to the top coat colours.	
4.12	Resistance to flash rusting	5.11 hereof

5.0 METHODS OF TESTING

5.1 Drying time.

Follow test method according to SANS 176 for Surface Dry & SANS 5148 for Hard Dry but use a doctor blade to apply one coat at a wet film thickness of 140 - 150 micrometers. The film must be hard dry within 2 hours.

5.2 Recoating time.

When spray applied at a wet film thickness of 140 -150 micrometer and allowed to dry for 1 hour according to SABS ISO 3270, the primer must be capable of being recoated with it self by hydraulic spray without development of any film defects. After 1, 5 hours drying (according to SABS ISO 3270).

5.3 Resistance to impact.

Follow the procedure outlined in SABS Method 146. Apply the primer, using a doctor blade, at a wet film thickness of 140 -150 micrometer. Age the panels for 7

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days under standard conditions (SABS ISO 3270) before conducting the test with the painted side of the panel facing the plunger.

5.4 Spraying properties.

Follow test method in accordance with SANS 5044 / SABS 44 and apply the unthinned primer to a wet film thickness of 140 -150 micrometers using suitable hydraulic spray equipment. A tip size of 0,020” must be used.

5.5 Appearance.

Spray apply a coat of the un-thinned primer to a wet film thickness of 140 -150 micrometers using suitable hydraulic spray equipment with a 0.020 spray tip, to steel panels cleaned and surface prepared in accordance with Part - 8 of this specification. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

5.6 Sagging.

5.6.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) by airless equipment a coat of primer to a wet film of 140 -150 micrometers. Place the panel in a vertical position along its long edge and allow the primer to dry according to SABS ISO 3270, for two hours.

5.6.2 Criteria.

To pass this test, the paint must not sag. (A thick edge at the bottom of the panel is not considered as sag).

5.7 Intercoat adhesion.

5.7.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper.

5.7.2 Procedure.

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Apply one coat of the un-thinned primer to a wet film thickness of 140 -150 micrometers using suitable hydraulic spray equipment to a test panel. A tip size of 0,020” must be used. Age the panel for 7 days under standard conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same primer to the panel as well as to a bare control panel. Again age for 7 days. Examine the panel for film defects and compare with the control panel.

Conduct the test on the test panel in accordance with SANS 2409.

5.7.3 Criteria.

There must be no difference in appearance between the two panels and the test panel must not show any signs of film defects such as blistering, wrinkling or loss of adhesion.

5.8 Adhesion.

5.8.1 Abraded steel.

5.8.1.1 Procedure.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper. Apply one coat of the un-thinned primer to a wet film thickness of 140 -150 micrometers using suitable hydraulic spray equipment to the test panel., the tip size must be a 0,020 spray tip and age for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with SANS 2409.

5.8.1.2 Criteria.

There must be no loss of adhesion between the primer and the steel.

5.8.2 Weathered Emulsion & Polyurethane Acrylic system.

5.8.2.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514.

- One coat paint Emulsion, Semi Gloss in accordance with Part 5 of this specification.

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- One coat Paint Polyurethane water based high gloss in accordance with Part 6 of this specification.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows :-

- 4 hours at 60°C UV and 4 hours at 40°C condensation cycle.

5.8.2.2 Procedure.

Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply one coat of the unthinned primer to a wet film thickness of 140 -150 micrometers using suitable hydraulic spray equipment to the test panel. A tip size of 0,020 must be used. Age the panels for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

5.8.2.3 Criteria.

There must be no loss of adhesion between the primer and the weathered coating system.

5.9 Resistance to salt fog.

5.9.1 Test panels.

Use four cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

5.9.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 micrometers.

5.9.3 Painting of panels.

Spray apply two coats of the un-thinned primer to a wet film thickness of 140 -150 micrometers each using suitable hydraulic spray equipment. A tip size of 0,020” must be used. Allow the first coat to dry for 2 hours before applying the second coat. Age the panels for 7 days at 25° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means. Prepare

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two additional panels as above but overcoat them after 24 hours by spraying with one coat of the same manufacturer's finishing paints complying with Part -5 of this specification to a wet film thickness of 140 - 150 micrometers & 80 -100 micrometers for Part 6 of this specification.

5.9.4 Procedure.

Ensure that the dry film thicknesses of the test panels are between 90 and 110 micrometers for the primed steel panels and between 140 and 160 micrometers for the complete system. Using a sharp knife, diagonally score the panels through to bare substrate from all four corners. Expose the panels in a salt fog cabinet according to SABS ISO 1519 for the respective specified periods.

5.9.5 Criteria.

For the primer and complete paint system to pass this test, there must be no signs of rust except in the scribed lines. There must be no blistering or any other film defects and no rust creep or loss of adhesion more than 3 mm, average, on either side of the scribe lines of both the primed and complete paint system panels.

5.10 Flexibility Valid for 4 weeks from 2023-11-24T12:44:40+0200

Follow the procedure outlined in SABS ISO 1519. Apply the primer with a doctor blade having a clearance to obtain a dry film thickness of 50 micrometers. Let the primer dry for 24 hours at standard conditions (SABS ISO 3270) and stove for 24 hours in an oven at 90° C ± 2° C. Cool to room temperature within 15 minutes before conducting the test using a 5 mm mandrel.

5.10.1 Criteria.

For the primer to pass there must be no defects found.

5.11 Resistance to flash rusting.

5.11.1 Panels.

Use three clean mild steel panels 300 mm X 300 mm X 2 mm. Abrasive blast clean the panels to cleanliness of Sa 2½ in accordance with ISO 8501-01 with a maximum blast profile of 60 micrometers. Apply a coat of primer to the newly cleaned panels to a wet film thickness of 140 - 150 microns. (Dry film thickness of 50 microns).

5.11.2 Exposure.

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Expose the first panel under standard conditions in a constant temperature room (SABS ISO 3270) for 1 hour. Expose the second panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 38° C for 1 hour. Expose the third panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 8° C for 1 hour. Remove the panels and examine for any visible signs of flash rusting.

5.11.3 Criteria.

No evidence of flash rusting must be visible on either of the painted panels.

5.12 Condition in container.

In addition to the requirements of SABS Method 1524, the primer must be supplied ready for use in the containers without the need for straining to remove skins or coarse particles.

The consistency of every batch must be measured (SABS Method 153) after stirring and noted for later reference. The value measured of consecutive batches must remain within 10 % of the value measured of the initial batch.

5.13 Pin holes valid for 4 weeks from 2023-11-24T12:44:40+0200

5.13.1 Procedure.

Prepare test panels according to clauses 5.9.1 to 5.9.3 of this specification. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

5.13.2 Criteria.

The complete paint system must be pinhole free.

5.14 Minimum film forming temperature (MFT).

5.14.1 Follow the test method as described in ASTM 2354.

5.14.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening / cracking or both.

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Annex No. 1 to Part - 3 of Specification RS/ME/SP/009

Product Qualification Certificate

Primer Coating, Emulsion, High Build, Rust Inhibitive

Tenderer: _____ **Certificate No. :** _____

Manufacture: _____

Name of Material: _____

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			

2.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
2.1	Non-volatile content	% m/m			
2.2	Volume solids	%			
2.3	Fineness of grind	µm			
2.4	Drying Time: i) Surface ii) Dry to handle iii) Hard	h h h			
2.5	Recoating time	h			
2.6	pH				
2.7	Resistance to impact (direct)	J			
2.8	Mass per litre	g			
2.9	Consistency	g			

3.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance	
3.5	Sagging	
3.6	Inter coat adhesion	
3.7	Adhesion i) ii)	

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CLAUSE	PROPERTY	REMARKS
3.8	Flexibility	
3.9	Freeze-thaw stability	SABS 1586-1995
3.10	Colour No.	
3.11	Resistance to salt fog : i) Primer, 200 hrs ii) System, 500 hrs	
3.12	Resistance to flash rusting	

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

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Signed: _____

Date: _____

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Annex No. 2 to Part - 3 of Specification RS/ME/SP/009

Batch control test certificate.

Primer Coating, Emulsion, High Build, Rust Inhibitive

Manufacture: _____

Name of material: _____ **Batch No.:** _____

1.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Non-volatile content	% m/m	
1.2	Volume solids	%	
1.3	Fineness of grind	µm	
1.4	Drying time : i) Surface ii) Hard	h	
		h	
1.5	Recoating time	h	
1.6	pH		
1.7	Mass per litre	g	
1.8	Consistency	g	

2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance	
2.4	Sagging	
2.5	Colour	
2.6	Resistance to flash rusting	

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PART 4.

SPECIFICATION FOR FILLER, DENT, METAL SURFACE, WATER BASED EPOXY

1.0 SCOPE

This specification covers the requirements for a two-pack water based dent filler suitable for knife and trowel application to major imperfections in the bodywork of Transnet's rolling stock and forms part of the rolling stock's paint system. The filler will be applied over a Primer Coating, conforming to Parts 2 & 3 of this specification, and over coated with the same primer.

2.0 QUALIFICATION

The material must comply with all the requirements of this specification.

3.0 COMPOSITION

The dent filler must be made up by mixing two components of contrasting colours in a one to one ratio by volume. The volatile content of the mixed material must not be more than 5 % by mass. The two components must consist of the following:

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3.1 Base.

The base component must consist of any suitable epoxy resin. It must be essentially free (i.e. contain less than 1.0 % by mass) of any un-reacted toxic or carcinogenic components that may have been used to produce it.

3.2 Curing Agent.

The curing agent must be a suitable polyamide. Preference will be given to materials having low toxicity.

3.3 Pigment.

The pigments, extenders, anti-settling agents and tinters must be distributed at the discretion of the manufacturer between the base and the curing agent.

3.4 Toxicity.

The filler, after mixing, must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following:

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- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6
- Any known or suspected carcinogen as listed in the latest issue of the ACGIH “Threshold limit values for chemical substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993 will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 50 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols
- Shall contain no Chloro iso thymol

4.0 QUANTITATIVE REQUIREMENTS

The dent filler, when mixed in a one to one ratio by volume, must form a paste which is suitable for knife and trowel application. The mixed material must conform to the requirements of Table 1.

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Table 1 - Quantitative Requirements.

CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX	
4.1	Penetration	10 ^{-1mm}	250	400	7.1 hereof
4.2	Working Properties and working time at 25 °C	h	1	-	7.2 hereof
4.3	Recoating time	h	-	4	7.3 hereof
4.4	Hardening time for wet sanding	h	-	12	7.4 hereof
4.5	Fineness of grind	µm	-	50	SABS ISO 1524
4.6	Resistance of impact	J	1,5	-	7.5 hereof

5.0 QUALITATIVE REQUIREMENTS

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The dent filler must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements.

CLAUSE	PROPERTY	TEST METHOD
5.1	Condition in the container (individual components)	SABS ISO 1524
5.2	Storage stability (12 months from date of delivery)	Supplier to certify date of delivery on batch release certificate
5.3	Sagging	7.6 hereof
5.4	Resistance to Cleaning Compound Acid	7.7 hereof

6.0 COLOUR

The colour of the base and curing agent components is not specified. The colour when mixed must produce a uniform colour.

7.0 METHODS OF TESTING

7.1 Penetration Valid for 4 weeks from 2023-11-24T12:44:40+0200

Immediately after mixing the material, determine its penetration in accordance with test method 6.12 of Transnet specification CSS 982/1.

7.2 Working properties and working time at 25 °C.

7.2.1 Test panels.

Use cold rolled steel panels as described in SABS ISO 1514 and approximately 250 mm x 250 mm in size. Press a 3 mm deep dent with a diameter of 25 mm into the panels by suitable means.

7.2.2 Preparation of test panels.

Abrade lightly with grade 80 waterproof abrasive paper and degrease by suitable means to obtain a water-break-free surface.

7.2.3 Procedure.

Mix 500 ml of the material. Using a suitable stopping knife, fill the dent with the material flush with the edge of the dent. Apply the material with a trowel evenly to the rest of the panel at a wet film thickness of approximately 1,5 mm. Keep the remainder of the mixed material at 25 °C; repeat the working properties after one

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hour on a second panel. Suspend the panels in a vertical position for 4 hours at 25°C.

7.2.4 Criteria.

The material must be capable of being easily applied to give a smooth surface without crumbling or excessive dragging. It must not sag at the dent and it must not shrink on drying.

7.3 Recoating time.

7.3.1 Procedure.

Mix a suitable quantity of the material. Apply the freshly mixed material to a test panel as described in sub-clause 7.2 hereof. Leave the panel for 4 hours at standard conditions, SABS ISO 3270, before applying a second coat of the freshly mixed filler. Cure the panel at standard conditions for 12 hours and examine.

7.3.2 Criteria.

The second coat must cure without any visible film defects.

7.4 Hardening time for wet sanding.

7.4.1 Procedure.

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At the end of the 12 hour curing period, wet abrade the panel, referred to in sub-clause 7.3.1 hereof with grade 80 waterproof abrasive paper.

7.4.2 Criteria.

The material must be capable of being easily abraded to a smooth surface without clogging the abrasive paper.

7.5 Resistance to impact.

Follow the procedure outlined in SABS Method 146. Apply the freshly mixed material with a doctor blade having a clearance of 1 mm to the test panel previously primed with material conforming to Parts 2 & 3 of this specification. Age the panel for 7 days under standard conditions SABS ISO 3270.

7.6 Sagging.

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7.6.1 Procedure.

Use a doctor blade having a clearance of 3 mm. And film width of at least 50 mm to draw out a film of freshly mixed material over the length of a suitable water-break-free glass or aluminium test panel. Place the panel in a vertical position along its edge and allow drying according to SABS ISO 3270.

7.6.2 Criteria.

To pass this test, there must be no evidence of sagging or slumping down.

7.7 Resistance to cleaning compound, acid.

7.7.1 Test panels.

Use two panels prepared and aged as specified in clause 7.5 above.

7.7.2 Test solutions.

- Dilute one part of Cleaning Compound, Acid, Coach, conforming to CSS 285/23.01, in seven parts water to make up a 500 ml. test solution.
- Dilute one part of Cleaning Compound, Acid, Electric and Diesel Locomotive, conforming to CSS 285/23.03, in three parts to make up a 500 ml. test solution.

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7.7.3 Procedure.

Dip one test panel into solution (a) and one test panel into solution (b) for a period of two minutes. Remove and examine the panels.

7.7.4 Criteria.

There must be no evidence of any reaction whatsoever on the surface of the test panels.

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Annex No. 1 to Part - 4 of Specification RS/ME/SP/009

Product Qualification Certificate

Filler, Dent, Metal Surface, Water Based Epoxy.

Tenderer: _____ **Certificate No. :** _____

Manufacture: _____ **Tender No. :** _____

Name of Material: _____ **Tender Item No. :** _____

1.0 Composition.

CLAUSE	PROPERTY	UNITS	MIN	MAX	TYPICAL
1.1	Water content (mixed material)	% by mass			
1.2	Epoxide equivalent of epoxy resin	-			
1.3	Pigment composition	-			
1.4	Amine value of polyamide	-			

2.0 QUANTITATIVE REQUIREMENTS

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CLAUSE	PROPERTY	UNITS	MIN	MAX	TYPICAL
2.1	Recoating time	h			
2.2	Mass per litre	g			
2.3	Fineness of grind	µm			
2.4	Penetration	10 ⁻¹ mm			
2.5	Working properties and working time	h			
2.6	Hardening time for wet sanding	h			
2.7	Resistance to impact (direct)	J			

3.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container a) base b) Curing agent	
3.2	Storage stability	
3.3	Sagging	
3.4	Colour of cured material	
3.7	Resistance to Cleaning Compound, Acid a) b)	

4.0 COMPLIANCE WITH SPECIFICATION

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It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed: _____

Date: _____

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Annex No. 2 to Part - 4 of Specification RS/ME/SP/009

Batch control test certificate

Filler, Dent, Metal Surface, Water Based Epoxy.

Manufacture: _____

Name of material: _____ **Batch No.:** _____

Batch size: _____

1.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Fineness of grind	µm	
1.2	Recoating time	h	
1.3	Mass per litre	g	
1.4	Penetration	10 ⁻¹ mm	
1.5	Working properties & working time	h	
1.6	Hardening time for wet sanding	h	

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2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in container a) base b) curing agent	
2.2	Sagging	
2.3	Resistance to Cleaning Compound, Acid . a) b)	

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PART 5

SPECIFICATION FOR PAINT, EMULSION, SEMI-GLOSS

1.0 SCOPE

This specification covers the requirements for water based finishing paint of the colours specified in Table 1 for the exterior protection and decoration of Transnet's rolling stock. The paint is to be formulated specifically for hydraulic spray application to the exterior metal cladding of rail vehicles. It forms the top coat of the rolling stock paint system and will be applied over Primer coating, emulsion, high build, rust Inhibitive conforming to Parts 2 & 3 of this specification. It will be applied at ambient and surface temperatures between 8° C and 38° C, when the dew point is at least 5° C less than the surface temperature at a relative humidity of up to 80 %, and at most 22 °C less than the ambient surface temperature at a relative humidity of down to 0%.

Table 1. Paint colours

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The following are the colours of the final coats of paint which are required.

COLOUR	SPECIFICATION	USED
Graphite Grey	RAL 7024	Locos, Coaches & Wagons
Light Grey	RAL 7035	Locos, Coaches & Wagons
Traffic White	RAL 9016	Locos, Coaches & Wagons
Transnet Red	NCS S 1085-Y90R	Locos
Transnet Green	NCS S 4040-G70Y	Locos
Transnet Yellow	NCS S 1070-Y20R	Locos
Coach Yellow	RAL 075 70 60	Locos, Coaches & Wagons
Coach Turquoise	RAL 200 50 45	Coaches
Coach Purple	RAL 320 30 35	Coaches
Violet	B7-C-14	Locomotives
Plascothane Pure Orange	UP-7	Locomotives
French Grey	H30	Locomotives & Wagons
Pebble Grey	RAL 7032	Locomotives
Light Brown	G379	Locomotives

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Aqua Marine Blue	RAL 5002	Locomotives, Coaches
Blue Green	RAL 6004	Locomotives
Water Blue	RAL 5021	Locomotives, Coaches
TE Light Brown Velvaglo	TVW 2000	Locomotive Drivers Cab
French Grey	TWI 2000	Locomotive Engine Compartment

2.0 COMPOSITION

The paint must be a one pack acrylic dispersion type, containing non-toxic, light and weatherfast pigments, supplied ready for use. It must comply with the performance requirements which are specified below when applied at a minimum dry film thickness of 50 microns over suitably primed metal surfaces.

2.1 Pigment.

Any light and weatherfast pigment or mixture of pigments may be used, provided the paint complies with the toxicity clause 2.3 below.

2.2 Special ingredients

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The addition of small quantities of grinding, wetting, stabilising, anti-settling and thickening agents is left to the desecration of the manufacturer.

2.3 Toxicity

- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6, for colours mentioned in Table 1.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH "Threshold limit values for chemical substances and substances and physical agents in the work environment". Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols

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- Shall contain no Chloro iso thymol

3.0 QUANTITATIVE REQUIREMENTS

The paint must conform to the requirements of Table 2.

Table 2 - Quantitative Requirements

CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
3.1	Volume solids	%	35	-	ASTM D2697
3.2	Fineness of grind	μ	-	25	SABS ISO 1524
3.3	Drying time : Surface : Hard	h	-	1	6.2 hereof
		h	-	2	
3.4	Recoating time	h	1	1,5	6.3 hereof
3.5	Masking time	h	-	4	6.4 hereof
3.6	Gloss at 60°		65	70	6.5 hereof
3.7	pH		4,5	10,0	Potettionmetric
3.8	Resistance to scratching	g	1200	-	6.6 hereof
3.9	Pin holes				6.7 hereof
3.10	Minimum film forming temp.	°C	-	3	6.8 hereof
3.11	Sword Rocker Hardness	25 °C	20	-	6.17 hereof
		60° C	10	-	

4.0 QUALITATIVE REQUIREMENTS

The paint must conform to the requirements listed in Table 3.

Table 3 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
4.1	Condition of container	6.16 hereof
4.2	Storage stability (12 months)	Supplier to certify date of delivery on batch release certificate
4.3	Spraying properties	6.1 hereof
4.4	Pinholes	6.7 hereof
4.5	Min film forming temp.	6.8 hereof
4.6	Appearance and opacity	6.9 hereof
4.7	Sagging	6.10 hereof

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CLAUSE	PROPERTY	TEST METHOD
4.8	Intercoat adhesion	6.11 hereof
4.9	Adhesion to weathered coating systems	6.12 hereof
4.10	Resistance to accelerated weathering 500 hours	6.13 hereof
4.11	Flexibility (5 mm mandrill)	6.14 hereof
4.12	Washing and Cleanability	6.15 hereof

5.0 COLOUR

The colour of the paint film must be uniform and must match the colour as specified in Table 1. The colour must not deviate more than 0, 5 ΔE when measured on an ACS colour computer according to SABS ISO 7724.

6.0 METHODS OF TESTING

6.1 Spraying properties

Follow Test Method in accordance with SANS 5044 / SABS 44 and apply the unthinned paint to a wet film thickness of 140 -150 microns using suitable hydraulic spray equipment. A tip size of 0,020 must be used.

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6.2 Drying time

Follow test method according to SABS Method 148 with a mass of 4500 g. Use a doctor blade to apply one coat at a wet film thickness of 70 - 80 micrometers. The film must be hard dry within 2 hours when tested.

6.3 Recoating time

When spray applied at a wet film thickness of 140 -150 micrometer and allowed to dry under standard test conditions for 1 to 1,5 hours according to SABS ISO 3270, the paint must be capable of being recoated by itself by hydraulic spray without development of any film defects. After 2 hours drying (according to SABS ISO 3270) the film must be hard dry when tested according to SABS Method 148 with a mass of 1 200 g.

6.4 Masking time

6.4.1 The unthinned paint, when sprayed to a wet film thickness of 140 -150 microns using suitable hydraulic spray equipment using a tip size of 0,020” onto suitable glass panels and allowed to dry for 4 hours under standard test conditions

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(SABS ISO 3270), must be suitable for masking with Tape, Pressure Sensitive Adhesive, Masking, Tape.

The following test must be conducted at 25° C :

6.4.2 Place the tape flat onto the panel and pass a roller of 2 kg mass having a width of ± 64 mm once over the masking tape at a rate of ± 300 mm per minute.

6.4.3 Leave the tape on the surface for 1 hour and then strip the tape from the panel. Leave panel for ± 30 minutes to allow paint to recover before inspecting the paint film.

6.4.4 Criteria

The masking tape must not mark the painted surface in any way and any residual adhesive must be removable by light rubbing with a cloth moistened with white spirits without any visible damage to the paint.

6.5 Gloss

6.5.1 Follow the procedure as outlined in ISO 2813-1994, but only apply one coat of the unthinned paint to a wet film thickness of 140-150 microns using suitable hydraulic spray equipment. A tip size of 0,020 must be used. Weather the panel for 20 hours in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 according to the following cycle:

- 4 hours UV exposure at 60° C
- Followed by 4 hours condensation exposure at 40 ° C.

6.5.2 Criteria

After 20 hours of exposure, the gloss reading at 60° C must be 65 - 70.

6.6 Resistance to scratching

Follow the procedure outlined in SABS 147. The paint must be applied by means of a doctor blade to give a dry film thickness of 50 to 60 microns and aged for 7 days under standard test conditions (SABS ISO 3270).

6.6.1 Criteria

Report the minimum mass load required to penetrate through the coating to expose the bare steel.

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6.7 Pin holes.

6.7.1 Test Panels.

Use four cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

6.7.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 micrometers.

6.7.3 Painting of panels.

Spray apply one coat of the unthinned primer in accordance with Part 3 of this specification and one coat unthinned top coat to a wet film thickness of 140 -150 microns each using suitable hydraulic spray equipment. A tip size of 0,020 must be used. Allow the first coat to dry for 4 hours before applying the second coat. Age the panels for 7 days at 25° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means. Prepare two additional panels as above but overcoat them after 24 hours by spraying with one coat of the same manufacturer's finishing paints complying with Part -5 of this specification to a wet film thickness of 140 - 150 micrometers.

6.7.4 Procedure.

Ensure that the dry film thickness of the panels is between 100 and 120 micrometers for the complete system. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

6.7.5 Criteria.

The complete paint system must be pinhole free.

6.8 Minimum film forming temperature (MFT).

6.8.1 Follow the test method as described in ASTM 2354.

6.8.2 Criteria.

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The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening or cracking or both.

6.9 Appearance and opacity.

6.9.1 Spray apply one coat of the unthinned paint to a wet film thickness of 140 - 150 microns using suitable hydraulic spray equipment A 0,020” tip must be used, to slightly sanded primed steel panels. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

6.9.2 When the paint is applied as above to a Morest hiding power chart (zebra chart) the dry film must completely hide the black and white stripes on the chart.

6.10 Sagging

6.10.1 Procedure

Spray apply onto a glass panel (300 mm X 400 mm) by airless equipment a coat of paint to a wet film of 150 -160 microns. Place the panel in a vertical position along its long edge and allow the primer to dry according to SABS ISO 3270, for two hours.

6.10.2 Criteria

To pass this test, slight thickening of the lower horizontal edge will be tolerated provided that:

- No tearing or curtaining is evident.
- There is no film slumping or reduction of film thickness which can be identified by loss of opacity just below the top horizontal line.

6.11 Intercoat adhesion

6.11.1 Test panels

Use cold rolled steel test panels of approximate size 70 mm x 150 mm x 0,8 mm as described in SABS ISO 1514. Abrade the panel with grade 180 abrasive paper.

6.11.2 Procedure

Apply one coat of the unthinned paint to a wet film thickness of 140 -150 microns using suitable hydraulic spray equipment to one test panel. A tip size of 0,020”

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must be used. Age the panel for 24 hours under standard test conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same paint to this panel as well as to a bare control panel. Again age for 24 hours. Examine the panel for film defects and compare with the control panel. Conduct the following test on the test panel:-

Conduct the test on the test panel in accordance with specification SANS 2409.

6.11.3 Criteria

There must be no loss of intercoat adhesion. The first coat must be sufficiently softened to give a good bond with the second coat but must not be disturbed, wrinkled, dissolved or show any defect on application of the second coat. On drying there must be no difference in the appearance of the second coat when compared to the control panel.

6.12 Adhesion weathered water based coating systems.

6.12.1 Test panels

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Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Spray the panels with a polyurethane acrylic system as follows:-

- First coat - One coat Primer Coating, Emulsion, High Build, Rust Inhibitive in accordance with Part - 3 of this specification.
- Second coat - One coat Paint, Emulsion, Semi Gloss in accordance with Part - 5 of this specification.

The colour must be contrasting to that of the paint being tested.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows:-

- 4 hours at 60°C UV
- And 4 hours at 40°C condensation cycle.

6.12.2 Procedure.

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Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply one coat of the unthinned primer to a wet film thickness of 140 -150 microns using suitable hydraulic spray equipment to the test panel. A tip size of 0,020” must be used. Age the panels for 7 days under standard test conditions (SABS ISO 3270).

6.12.3 Conduct the test on the test panel in accordance with specification SANS 2409.

6.12.4 Criteria.

There must be no loss of adhesion between the paint and the weathered coating system.

6.13 Resistance of accelerated weathering.

6.13.1 Test panels.

Use four “water-break-free aluminium test panels of suitable size and spray apply one coat of the same manufacture’s primer complying to Part - 3 of this specification at a wet film thickness of 140 -150 microns to two panels. Allow to dry for four hours at standard test conditions. Spray apply one coat of the test paint at a wet film thickness of 140 - 150 microns to all four of the test panels. Age the panels for seven days at standard test conditions.

6.13.2 Procedure

Expose one system panel and one finishing coat panel in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 and operate according to the following cycle for the specified period: four hours UV exposed at 60°C and four hours condensation exposure at 40° C. Retain the other two panels for control purposes.

6.13.3 Regular inspections must be carried out during the exposure period and a through examination, in comparison with the control panel must be done at the end of the test in accordance with SABS ISO 4628.

6.13.4 Criteria.

During or at the end of the exposure period, the paint film shall:

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- Show a minimum of chalking (equivalent to rating 2 of SABS ISO 4628-6) and no evidence of alligating, checking, blistering or any other defects.
- Have a colour change equivalent to a lightness difference (ΔL) of less than four units when tested according to specification SABS ISO 7724-1/2.
- Have a loss of gloss of not more than 50% of the original gloss measured before exposure.

6.14 Flexibility.

6.14.1 Procedure.

Follow the procedure outlined in SABS ISO 1519. Apply the paint with a doctor blade having a clearance of 250 microns. Age for 7 days under standard conditions, SABS ISO 3270. Conduct the test using a 3 mm mandrel.

6.14.2 Criteria.

The paint film when bent through 180° over a 5 mm mandrel must show no cracks or any other defects under 10X magnification.

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6.15 Washability and Cleanability.

6.15.1 Procedure.

Prepare panels according to SABS ISO 1258 for the washability and cleanability tests. Apply the coating to a wet film thickness of 140 -150 microns. Allow the panels to dry for 7 days according to SABS ISO 3270.

6.15.2.1 Procedure: Wash ability.

Follow the method as described in SABS Method 1258.

6.15.2.2 Procedure: Clean ability.

Expose two of the panels at 60 °C in an oven for 30 minutes. During this time, soil half of the painted surfaces of the panels with A4 carbon black pigment by using a circular motion of a finger until an even heavy stain of the surface has been obtained. Leave for a further 30 minutes. Remove the panels from the oven and blow off the excess pigment and allow the panels to reach room temperature.

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Subject the panels to the clean ability test as described in SABS Method 1258. Note how many oscillations are necessary to remove the carbon black contaminant.

6.15.3.1 Criteria: Wash ability

The paint film must be washable according to SABS Method 1258.

6.15.3.2 Criteria: Clean ability.

The contaminant must be removed so, that the previously contaminated surface is indistinguishable from the uncontaminated surface after no more than 50 oscillations.

6.16 Condition in container.

In addition to the requirements of SABS ISO 1513, the paint must be supplied ready for use in the container without the need for straining to remove skins or coarse particles. The consistency of all batches of one colour must be uniform batch to batch without the need for thinning when the paint is at 25 °C.

The consistent every batch must be measured, SABS 153 after stirring and noted for later reference.

6.17 Sward Rocker Hardness.

6.17.1 Procedure.

Using a doctor blade, apply one coat of paint to a wet film thickness of 140 -150 microns to suitably sizes water-break free glass panels. Allow the panels to dry under standard conditions, SABS ISO 3270, for 48 hours. Thereafter, place the panels in an oven at 60 °C for 3 hours. Remove and allow cooling.

Determine the sward rocker hardness at 23 ± 2 °C according to ASTM D2134. Expose the panels at 60 °C in an oven for 30 minutes and determine the hardness at 60 °C. Conduct the 60 °C test outside the oven but be sure that the vibration or air circulation of the oven fan does not affect the test.

6.17.2 Criteria

The sward rocker hardness at 23 °C must be at least 20 oscillations and at 60 °C must be at least 10 oscillations.

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Annex No. 1 to Part - 5 of Specification RS/ME/SP/009

Product Qualification Certificate

Paint, Emulsion, Semi-Gloss

Tenderer : _____

Manufacture: _____

Name of Material : _____

(Copies of this form must be used for each of the respective colours)

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			
1.4	Pigment composition				

2.0 QUANTITATIVE REQUIREMENTS

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CLAUSE	PROPERTY	UNITS	MIN	MAX	TYPICAL
2.1	Volume solids	%			
2.2	Fineness of grind	µm			
2.3	Drying Time: i) Surface ii) Hard	h			
		h			
2.4	Recoating time	h			
2.5	pH				
2.6	Recoating time	h			
2.7	Masking time	h			
2.8	Consistency	g			
2.9	Gloss				
2.10	Resistance to scratching	g			
2.11	Mass per litre	g			
2.12	Pinholes				
2.13	Sword Rocker hardness i) 25°C ii) 60° C				

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3.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance and opacity	
3.5	Sagging	
3.6	Adhesion: Weathered coating systems	
3.7	Intercoat adhesion i)	
	ii)	
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour No.	
3.11	Resistance to accelerated weathering	
	i) film defects	
	ii) Lightness difference	
3.12	iii) Percentage loss of gloss	
	i) Wash ability	
	ii) Clean ability	

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed : _____

Date : _____

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Annex No. 2 to Part - 5 of Specification RS/ME/009

Batch control test certificate

Paint, Emulsion, Gloss

Manufacture: _____

Name of material: _____ **Batch No.:** _____

Batch size: _____

1. QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Fineness of grind	µm	
1.2	Drying time : i) Surface	h	
	ii) Hard	h	
1.3	Recoating time	h	
1.4	pH		
1.5	Mass per litre	g	
1.6	Consistency	g	
1.7	Masking time	h	
1.8	Gloss i)		
1.9	Sword Rocker hardness	i) 25 °C	
		ii) 60° C	

2. QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance and opacity	
2.4	Sagging	
2.5	Colour	

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PART 6

SPECIFICATION FOR PAINT, TWO PACK POLYURETHANE, WATER BASED SYSTEM

1.0 SCOPE

This specification covers the requirements for a Two Pack, Polyurethane, Water Based, system of the colours specified in Table 1 for the exterior protection and decoration of Transnet's rolling stock. The materials must be supplied in dual containers and formulated specifically for hydraulic spray application to the exterior metal cladding of rail vehicles. (Air assisted Airless equipment will also be considered). It forms the top coat of the rolling stock paint system and will be applied over Primer coating, emulsion, high build, rust Inhibitive conforming to Part - 3 of this specification. It will be applied at ambient and surface temperatures between 8° C and 38° C, when the dew point is at least 5° C less than the surface temperature at a relative humidity of up to 80 %, and at most 22 °C less than the ambient surface temperature at a relative humidity of down to 0%.

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Table 1. Paint colours.

COLOUR	SPECIFICATION	USED
Graphite Grey	RAL 7024	Locos, Coaches & Wagons
Light Grey	RAL 7035	Locos, Coaches & Wagons
Traffic White	RAL 9016	Locos, Coaches & Wagons
Transnet Red	NCS S 1085-Y90R	Locos
Transnet Green	NCS S 4040-G70Y	Locos
Transnet Yellow	NCS S 1070-Y20R	Locos
Coach Yellow	RAL 075 70 60	Locos, Coaches & Wagons
Coach Turquoise	RAL 200 50 45	Coaches
Coach Purple	RAL 320 30 35	Coaches
Violet	B7-C-14	Locomotives
Plascothane Pure Orange	UP-7	Locomotives
French Grey	H30	Locomotives & Wagons
Pebble Grey	RAL 7032	Locomotives
Light Brown	G379	Locomotives

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Aqua Marine Blue	RAL 5002	Locomotives, Coaches
Blue Green	RAL 6004	Locomotives
Water Blue	RAL 5021	Locomotives, Coaches
TE Light Brown Velvaglo	TVW 2000	Locomotive Drivers Cab
French Grey	TWI 2000	Locomotive Engine Compartment

2.0 COMPOSITION

2.1 Base.

The base must consist of any suitable non-toxic, light and weatherfast pigments or mixture of pigments and extenders, tinting pigments and additives, supplied ready for use. It must comply with the performance requirements which are specified below when mixed with the curing agent and applied at a total minimum dry film thickness of 50 microns, over suitably primed metal surfaces.

2.1.2 Binders.

The binders must consists of any suitable non-toxic, water soluble hydroxyl terminated polymer, having the necessary functional groups to react with the curing agent to give a product capable of meeting the performance requirements of this specification, provided the paint complies with the toxicity clause 2.5 below.

2.2 Curing agent.

The curing agent must be a linear aliphatic isocyanate, free of any un-reacted monomers. It must be mixable with water and capable of cross-linking with the binder resin at ambient temperatures of between 8 °C and 38 °C.

2.3 Special ingredients.

The addition of small quantities of grinding, wetting, stabilising, anti-settling and thickening agents is left to the desecration of the manufacturer.

2.4 Solvents.

The paint as supplied must contain not more than 4% non-toxic organic solvents.

2.5 Toxicity.

The paint, after mixing, must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following:-

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- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Must contain no formaldehyde.
- Must contain no Alkyl Phenol
- Must contain no Chloro iso thymol

3.0 MIXING RATIO

The mixing ratio of base to curing agent must be a simple ratio by weight or volume. (Whole numbers).

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4.0 QUANTITATIVE REQUIREMENTS

The paint when mixed in the required ratio must conform to the requirements of Table 2.

Table 2 - Quantitative Requirements.

CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
4.1	Volume solids	%	38	-	ASTM D2697
4.2	Fineness of grind	μ	-	15	SABS ISO 1524
4.3	Drying time : Surface : Hard	h	-	2	7.3 hereof
			-	8	
4.4	Masking time	h	-	8	7.4 hereof
4.5	Recoating time	h	-	0,5	7.5 hereof
4.6	Gloss at 60°		80	85	7.6 hereof
4.7	pH		7,5	8,5	Potettionmetric
4.8	Resistance to scratching	g	2000	-	7.7 hereof
4.9	Pin holes				7.8 hereof
4.10	Minimum film forming temp.	°C	-	3	7.9 hereof
4.11	Sword Rocker Hardness 23 °C		50	-	7.18 hereof

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CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
	60° C		25	-	

5.0 QUALITATIVE REQUIREMENTS

The paint, when mixed, must conform to the requirements listed in Table 3.

Table 3 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
5.1	Storage stability (12 months from date of delivery)	Supplier to certify date of delivery on batch release certificate
5.2	Spraying properties	7.2 hereof
5.3	Pinholes	7.8 hereof
5.4	Minimum film forming temperature	7.9 hereof
5.5	Appearance and opacity	7.10 hereof
5.6	Sagging	7.11 hereof
5.7	Intercoat adhesion	7.12 hereof
5.8	Adhesion to weathered coating systems	7.13 hereof
5.9	Resistance to accelerated weathering 500 hours	7.14 hereof
5.10	Flexibility (3 mm mandrill)	7.15 hereof
5.11	Washing and Cleanability	7.16 hereof
5.12	Condition of container	7.17 hereof

6.0 COLOUR

The colour of the paint film must be uniform and must match the colour as specified in Table 1. The colour must not deviate more than 0, 5 ΔE when measured on an ACS colour computer according to SABS ISO 7724.

7.0 METHODS OF TESTING

7.1 Pot life.

Condition the unmixed paint at a temperature of between 22 °C and 24 °C.

Mix 500 ml of paint as per clause 3 above. Allow a period of 15 minutes for induction. Thin the paint down with water to attain a viscosity of between 40 and 45 seconds, Ford Cup 4. The efflux viscosity of the paint must not increase to

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more than 75 seconds after 2 hours. The test must be done at an atmospheric temperature of 23 °C in an open container.

7.2 Spraying and recoating properties.

Mix and thin the paint as per clause 7.1 above. Clean and degrease a glass panel of approximate size 150 mm x 450 mm x 6 mm. The test panel must be completely dry. Place the test panel in a vertical position in the spray booth. Spray apply the first coat of paint to a wet film thickness of 25 - 51 microns. Allow a flash off time of ± 20 minutes. Spray applies a second coat of paint to a wet film thickness of 51 - 76 microns. The spray application must be done using suitable hydraulic spray equipment. Allow the paint to dry at 23 °C ± 2 °C for 8 hours. (SABS Method 3270)

7.2.1 Criteria.

Upon drying, the paint film must be uniform and glossy free from runs, sags, bloom, excessive orange peel, wrinkling, pinholes or any other defects.

7.3 Drying time.

Follow test method for Surface Hard, SANS 176 & Hard Dry, SANS 5148 but use a doctor blade to apply one coat at a wet film thickness of 51-76 microns.

7.4 Masking time.

Mix and apply the paint as per clause 7.2 above to suitable glass panels. Allowed to dry for 8 hours under standard test conditions (SABS ISO 3270), the coating must be suitable for masking with Tape, Pressure Sensitive Adhesive, Masking, Smooth Tape. The following test must be conducted at 23° C :

Place the tape flat onto the panel and pass a roller of 2 kg mass having a width of ± 64 mm once over the masking tape at a rate of ± 300 mm per minute.

Leave the tape on the surface for 1 hour and then strip the tape from the panel.

Leave panel for ± 30 minutes to allow paint to recover before inspecting the paint film.

7.4.1 Criteria.

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The masking tape must not mark the painted surface in any way and any residual adhesive must be removable by light rubbing with a cloth moistened with white spirits without any visible damage to the paint.

7.5 Recoating time.

When spray applied at a total wet film thickness of 76 - 127 microns as per clause 7.2 above and allowed to dry under standard test conditions for 1 to 1,5 hours according to SABS ISO 3270, the paint must be capable of being recoated by itself using hydraulic spray application without development of any film defects. After 8 hours drying (according to SABS ISO 3270) the film must be hard dry when tested according to SABS Method 148 with a mass of 1 200 g.

7.6 Gloss.

Follow the procedure as outlined in ISO 2813-1994, but apply two coats of the thinned paint as per clause 7.2 above onto a smooth glass panel of size 70 mm x 150 mm x 3 mm. Allow to dry at standard drying conditions for 8 hours. Weather the panel for 20 hours in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 according to the following cycle:

- 4 hours UV exposure at 60° C
- Followed by 4 hours condensation exposure at 40 ° C.

7.7.2 Criteria.

The gloss reading must be measure at a 60° head after the first 8 hours of drying as well as after 20 hours of exposure, all readings obtained must between 80 - 85.

7.7 Resistance to scratching.

Follow the procedure outlined in SABS 147. The paint must be applied by means of a doctor blade to give a dry film thickness of 50 to 60 microns and aged for 7 days under standard test conditions (SABS ISO 3270). Measure and record the dry film thickness.

7.7.1 Criteria.

Report the minimum mass load required to penetrate through the coating to expose the bare steel.

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7.8 Pin holes.

7.8.1 Test Panels.

Use two cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

7.8.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 microns.

7.8.3 Painting of panels.

Spray apply one coat of the unthinned primer coating conforming to “Part - 3” of this specification and two coats of the thinned top coat as per clause 7.2 of this specification each using suitable hydraulic spray equipment. Age the panels for 7 days at 23° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means.

7.8.4 Procedure. valid for 4 weeks from 2023-11-24T12:44:40+0200

Ensure that the dry film thickness of the panels are between 100 and 120 micrometers for the complete system. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

7.8.5 Criteria.

The complete paint system must be pinhole free.

7.9 Minimum film forming temperature (MFT).

7.9.1 Follow the test method as described in ASTM 2354.

7.9.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening or cracking or both.

7.10 Appearance and opacity.

7.10.1 Procedure.

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Spray apply two coats of the thinned paint as per clause 7.2 of this specification, to slightly sanded primed steel panels as well as a Morest hiding power chart. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

7.10.2 Criteria

When the paint is applied as above to the Morest hiding power chart the dry film must completely hide the black and white stripes on the chart.

7.11 Sagging.

7.11.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) two coats of the thinned paint as per clause 7.2 of this specification. Place the panel in a vertical position along its long edge and allow the paint to dry according to SABS ISO 3270, for two hours. **Valid for 4 weeks from 2023-11-24T12:44:40+0200**

7.11.2 Criteria.

To pass this test, slight thickening of the lower horizontal edge will be tolerated provided that :

- No tearing or curtaining is evident.
- There is no film slumping or reduction of film thickness which can be identified by loss of opacity just below the top horizontal line.

7.12 Intercoat adhesion.

7.12.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm x 150 mm x 0,8 mm as described in SABS ISO 1514. Abrade the panel with grade 180 abrasive paper.

7.12.2 Procedure.

Apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panel for 24 hours under standard test conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same paint to this panel as well as to

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a bare control panel. Again age for 24 hours. Examine the panel for film defects and compare with the control panel. Conduct the following test on the test panel:-
Conduct the test on the test panel in accordance with specification SANS 2409.

7.12.3 Criteria.

There must be no loss of intercoat adhesion. The first coat must be sufficiently softened to give a good bond with the second coat but must not be disturbed, wrinkled, dissolved or show any defect on application of the second coat. On drying there must be no difference in the appearance of the second coat when compared to the control panel.

7.13 Adhesion to weathered water based coating systems.

7.13.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Spray the panels with a emulsion acrylic system as follows:-

- First coat - One coat Primer Coating, Emulsion, High Build, Rust Inhibitive in accordance with Part - 3 of this specification.
- Second coat - One coat Paint, Emulsion, Semi-Gloss in accordance with Part - 5 of this specification.

The colour must be contrasting to that of the paint being tested.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows:-

- 4 hours at 60°C UV
- And 4 hours at 40°C condensation cycle.

7.13.2 Procedure.

Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panels for 7 days under standard test conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

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7.13.3 Criteria.

There must be no loss of adhesion between the paint and the weathered coating system.

7.14 Resistance of accelerated weathering.

7.14.1 Test panels.

Use four “water-break-free” aluminium test panels of suitable size and spray apply one coat of the same manufacture’s primer complying to Part - 3 of this specification at a wet film thickness of 130 - 150 microns to two panels. Allow to dry for four hours at standard test conditions. Spray apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panels for seven days at standard test conditions. Measure and record the gloss reading at a 60° head.

7.14.2 Procedure

Expose one system panel and one finishing coat panel in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 and operate according to the following cycle for the specified period : four hours UV exposed at 60°C and four hours condensation exposure at 40° C. Retain the other two panels for control purposes.

7.14.3 Regular inspections must be carried out during the exposure period and a through examination, in comparison with the control panel must be done at the end of the test in accordance with SABS ISO 4628.

7.14.4 Criteria.

During or at the end of the exposure period, the paint film shall:

- Show a minimum of chalking (equivalent to rating 2 of SABS ISO 4628-6) and no evidence of alligating, checking, blistering or any other defects.
- Have a colour change equivalent to a lightness difference (ΔL) of less than four units when tested according to specification SABS ISO 7724-1/2.
- Have a loss of gloss of not more than 50% of the original gloss measured before exposure.

7.15 Flexibility.

7.15.1 Procedure.

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Follow the procedure outlined in SABS ISO 1519. Apply the paint with a doctor blade having a clearance of 150 microns. Age for 7 days under standard conditions, SABS ISO 3270. Conduct the test using a 3 mm mandrel.

7.15.2 Criteria.

The paint film when bent through 180° over a 5 mm mandrel must show no cracks or any other defects under 10 x magnification.

7.16 Washability and Cleanability.

7.16.1 Procedure.

Prepare two panels according to SABS ISO 1258 for the washability and two glass panels for the cleanability tests. Apply two coats of the thinned paint as per clause 7.2 of this specification. Allow the panels to dry for 7 days according to SABS ISO 3270.

7.16.2.1 Procedure: Washability.

Follow the method as described in SABS Method 1258.

7.16.2.2 Procedure: Cleanability.

Expose the two glass panels at 60 °C in an oven for 30 minutes. During this time, soil half of the painted surfaces of the panels with A4 carbon black pigment by using a circular motion of a finger until an even heavy stain of the surface has been obtained. Leave for a further 30 minutes. Remove the panels from the oven and blow off the excess pigment and allow the panels to reach room temperature. Subject the panels to the cleanability test as described in SABS Method 1258. Note how many oscillations are necessary to remove the carbon black contaminant.

7.16.3.1 Criteria: Washability

The paint film must withstand 200 wet-scrub cycles according to SABS Method 1258 with an average loss in coating thickness of less than 70 microns.

7.16.3.2 Criteria: Cleanability.

The contaminant must be removed so that the previously contaminated surface is indistinguishable from the uncontaminated surface after no more than 30 oscillations.

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7.17 Condition in container.

In addition to the requirements of SABS ISO 1524, the paint must be supplied ready for use in the container without the need for straining to remove skins or coarse particles. The consistency of all batches of one colour must be uniform batch to batch when the paint is at 23 °C.

The consistent every batch must be measured, SABS 153 after mixing and noted for later reference.

7.18 Sward Rocker Hardness.

7.18.1 Procedure.

Using a doctor blade, apply one coat of paint to a wet film thickness of 51-76 microns to suitably sized water-break free glass panels. Allow the panels to dry under standard conditions, SABS ISO 3270, for 48 hours. Thereafter, place the panels in an oven at 60 °C for 3 hours. Remove and allow cooling.

Determine the sward rocker hardness at 23 ± 2 °C according to ASTM D2134. Expose the panels at 60 °C in an oven for 30 minutes and determine the hardness at 60 °C. Conduct the 60 °C test inside the oven but be sure that the vibration or air circulation of the oven fan does not affect the test.

7.18.2 Criteria.

The sward rocker hardness at 23 °C must be at least 50 oscillations and at 60 °C must be at least 25 oscillations.

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Product Qualification Certificate

Paint, Two Pack Polyurethane, Water Based.

Tenderer: _____

Manufacture: _____

Name of Material: _____

(Copies of this form must be used for each of the respective colours)

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			
1.4	Pigment composition				

2.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX	TYPICAL
2.1	Volume solids	%	40	46	43
2.2	Fineness of grind	µm			
2.3	Drying Time: i) Surface ii) Hard	h h			
2.4	Recoating time	h			
2.5	pH				
2.6	Recoating time	h			
2.7	Masking time	h			
2.8	Consistency (unthinned paint at 23°C ± 2°C.	g			
2.9	Gloss				
2.10	Resistance to scratching	g			
2.11	Mass per litre	g			
2.12	Pinholes				
2.13	Sword Rocker hardness i) 23°C ii) 60° C				

3.0 QUALITATIVE REQUIREMENTS

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CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance and opacity	
3.5	Sagging	
3.6	Adhesion: Weathered coating systems	
3.7	Intercoat adhesion i) ii)	
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour No.	
3.11	Resistance to accelerated weathering i) film defects ii) Lightness difference iii) Percentage loss of gloss	
3.12	i) Washability (loss in thickness after 200 wet-scrub cycles) ii) Cleanability (no. of wet-scrub cycles to remove soil)	

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4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed : _____

Date : _____

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Annex No. 2 to Part - 6 of Specification RS/ME/SP/009

Batch control test certificate.

Paint, Two Pack Polyurethane, Water Based.

Manufacture : _____

Name of material: _____ **Batch No.:** _____

Batch size : _____

1.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Fineness of grind	µm	
1.2	Drying time : i) Surface ii) Hard	h	
		h	
1.3	Recoating time	h	
1.4	pH		
1.5	Mass per litre	g	
1.6	Consistency (unthinned paint at 23 °C ± 2 °C)	g	
1.7	Masking time	h	
1.8	Gloss i)		
1.9	Sword Rocker hardness i) 23 °C ii) 60° C		

2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance and opacity	
2.4	Sagging	
2.5	Colour	

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PART 7

SPECIFICATION FOR A HEAVY DUTY COATING FOR TRANSNET'S ROLLING STOCK

1.0 SCOPE

This specification covers the requirements for pure acrylic water based heavy duty coating for rolling stock. The coating must be compatible with all other coatings as specified in specification RS/ME/SP/009.

This coating is intended for use where exceptional flexibility, high abrasion resistance, water resistance, chemical resistance, sound deadening, anti drumming, impact resistance & bridging properties are required.

The coating must be applied at ambient and surface temperatures between 5° C and 38° C, when the dew point is at least 5° C less than the surface temperature and at relative humidity of 80 % maximum.

2.0 COMPOSITION

The coating must be a single pack pure acrylic dispersion type, containing non-toxic rust inhibitive pigments and fillers.

The coating must be supplied ready for use by airless spray application and must be formulated to be flash rust resistant. It must comply with the performance requirements which are specified below when applied at a dry film thickness of 300 & 2000 micrometers over steel surfaces cleaned and treated in accordance with Part - 8 of this specification & prime coated with a primer in accordance with Part 2 or 3 of this specification.

2.1 Binder.

The binder shall be a pure acrylic dispersion containing less than 1% free monomer.

2.2 Pigment.

The pigment shall consist of recognised rust Inhibitive pigments together with the necessary inert fillers and colour pigments.

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2.3 Toxicity.

The coating shall not contain more than 1, 0 % by mass, calculated on the total composition, of any of the following:-

- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols
- Shall contain no Chloro iso thymol

3.0 QUANTITATIVE REQUIREMENTS

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The Coating must conform to the requirements of Table 1.

Table 1 - Quantitative Requirements

CLAUSE	PROPERTY	UNIT	LIMITS		TEST METHOD
			min	max.	
3.1	Volume solids	%	50	-	ASTM D2697
3.2	Drying time: Dry to handle	h	-	4	5.1 hereof
3.3	Recoating time at 2000µm	h	-	12	5.2 hereof
3.4	Resistance to direct impact @ 2000 µm dft.	J	10 kg	-	5.3 hereof
3.5	Min. film forming temp @ 500 µm wet film thickness.	°C	3	-	5.12 hereof

4.0 QUALITATIVE REQUIREMENTS

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The coating must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
4.1	Condition in container	SABS Method 1524
4.2	Storage stability 12 months from delivery date	Supplier to certify date of delivery on batch release certificate.
4.4	Appearance	5.4 hereof
4.5	Sagging	5.5 hereof
4.6	Intercoat adhesion	5.6 hereof
4.7	Adhesion : i) To abraded steel ii) To weathered Emulsion & Polyurethane Acrylic system	5.7 hereof
4.8	Resistance to salt fog : Full System 500 hrs	5.8 hereof
4.9	Flexibility (3 mm mandrill)	5.9 hereof
4.10	Freeze-thaw stability	SABS 1586-1995
4.11	Resistance to flash rusting	5.10 hereof

5.0 METHODS OF TESTING

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5.1 Drying time.

Follow test method according to SABS Method 148 with a mass of 4500 g.

Use a doctor blade to apply one coat at a wet film thickness of 2000 micrometers.

The film must be hard dry within 8 hours.

5.2 Recoating time.

When spray applied at a wet film thickness of 2000 micrometers and allowed to dry for 12 hours according to SABS ISO 3270, the coating must be capable of being recoated with it self by hydraulic spray without development of any film defects

5.3 Resistance to impact.

Follow the procedure outlined in SABS Method 146. Apply the coating, using a doctor blade, at a wet film thickness of 600 micrometers. Age the panels for 7 days under standard conditions (SABS ISO 3270) before conducting the test with the painted side of the panel facing the plunger.

5.4 Appearance.

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Spray apply a coat of the un-thinned coating to a wet film thickness of 4000 micrometers using suitable hydraulic spray equipment to a test panel. Allow panel to dry in the vertical position over night. The film must be uniform with no evidence of splitting or cracking.

5.5 Sagging.

5.5.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) by airless equipment a coat of the coating to a wet film of 5000 micrometers. Place the panel in a vertical position along its long edge and allow the coating to dry according to SABS ISO 3270, for 12 hours.

5.5.2 Criteria.

To pass this test, the coating must not sag. (A thick edge at the bottom of the panel is not considered as sag).

5.6 Intercoat adhesion.

5.6.1 Test panels.

Use cold rolled steel test panels of approximate size 150 mm X 450 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper.

5.6.2 Procedure.

Apply one coat of the un-thinned coating to a wet film thickness of 2000 micrometers using suitable hydraulic spray equipment to a test panel. A tip size of 041 must be used. Age the panel for 7 days under standard conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same coating to the panel as well as to a bare control panel. Again age for 7 days. Examine the panel for film defects and compare with the control panel. Conduct the following test on the test panel:-

Conduct the test on the test panel in accordance with specification SANS 2409.

5.6.3 Criteria.

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There must be no difference in appearance between the two panels and the test panel must not show any signs of film defects such as blistering, wrinkling or loss of adhesion.

5.7 Adhesion.

5.7.1 Abraded steel.

5.7.1.1 Procedure.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper. Apply one coat of the unthinned coating to a wet film thickness of 2000 micrometers using suitable hydraulic spray equipment to the test panel, the tip size must be a 0,041" spray tip and age for 7 days under standard conditions (SABS ISO 3270). Conduct the test on the test panel in accordance with specification SANS 2409.

5.7.1.2 Criteria.

There must be no loss of adhesion between the coating and the steel.

5.8 Resistance to salt fog.

5.8.1 Test panels. valid for 4 weeks from 2023-11-24T12:44:40+0200

Use four cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

5.8.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 micrometers.

5.8.3 Painting of panels.

Spray one coat of coating in accordance with Part 2 or 3 of this specification. Allow the coating to dry for 2 hours.

Apply one coat of the un-thinned coating to a wet film thickness of 1000 micrometers using suitable hydraulic spray equipment. A tip size of 0,041" must be used. Age the panels for 7 days at 23° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means.

5.8.4 Procedure.

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Ensure that the dry film thicknesses of the test panels are not less than 300 micrometers for the complete system. Using a sharp knife, diagonally score the panels through to bare substrate from all four corners. Expose the panels in a salt fog cabinet according to SABS ISO 1519 for the respective specified periods.

5.8.5 Criteria.

For the system to pass this test there must be no signs of rust except in the scribe lines. There must be no blistering or any other film defects and no rust creep or loss of adhesion more than 2 mm, average, on either side of the scribe lines.

5.9 Flexibility.

Follow the procedure outlined in SABS ISO 1519. Apply the coating with a doctor blade having a clearance to obtain a dry film thickness of 1000 micrometers. Let the coating dry for 24 hours at standard conditions (SABS ISO 3270) and stove for 24 hours in an oven at $90^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Cool to room temperature within 15 minutes before conducting the test using a 5 mm mandrel.

5.10 Resistance to flash rusting.

5.10.1 Panels.

Use three clean mild steel panels 300 mm X 300 mm X 2 mm. Abrasive blast clean the panels to cleanliness of Sa 2½ in accordance with ISO 8501-01 with a maximum blast profile of 60 micrometers. Apply a coat of the coating to the newly cleaned panels to a wet film thickness of 5000 microns.

5.10.2 Exposure.

Expose the first panel under standard conditions in a constant temperature room (SABS ISO 3270) for 1 hour. Expose the second panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 38°C for 1 hour. Expose the third panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 8°C for 1 hour. Remove the panels and examine for any visible signs of flash rusting.

5.10.3 Criteria.

No evidence of flash rusting must be visible on any of the painted panels.

5.11 Condition in container.

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In addition to the requirements of SABS Method 1524, the coating must be supplied ready for use in the containers without the need for straining to remove skins or coarse particles.

5.12 Minimum film forming temperature (MFT).

5.12.1 Follow the test method as described in ASTM 2354.

5.12.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening or cracking or both.

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Annex No. 1 to Part - 7 of Specification RS/ME/SP/009

Product Qualification Certificate

Heavy Duty Water Based Coating

Tenderer: _____

Manufacture: _____

Name of Material : _____

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			

2.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
2.1	Non-volatile content	% m/m			
2.2	Volume solids	%			
2.4	Drying Time: i) Surface ii) : Dry to handle	h h			
2.5	Recoating time	h			
2.7	Resistance to impact (direct)	J			
2.8	Mass per litre	g			
2.9	Consistency	g			

3.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance	
3.5	Sagging	
3.6	Inter coat adhesion	
3.7	Adhesion i) ii)	
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour	

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CLAUSE	PROPERTY	REMARKS
3.11	Resistance to salt fog : i) System, 500 hrs	
3.12	Resistance to flash rusting	

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed : _____

Date : _____

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Annex No. 2 to Part - 7 of Specification RS/ME/SP/009

Batch control test certificate

Heavy Duty Water Based Coating

Manufacturer : _____

Name of material: _____ **Batch No.:** _____

1.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Non-volatile content	% m/m	
1.2	Volume solids	%	
1.3	Drying time : i) Hard	h	
1.4	Recoating time	h	
1.5	Mass per litre	g	
1.6	Consistency	g	

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2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance	
2.4	Sagging	
2.5	Colour	
2.6	Resistance to flash rusting	

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PART 8

PAINT APPLICATION SPECIFICATION FOR TRANSNET'S ROLLING STOCK EMILSION SYSTEM & TWO PACK WATER BASED PAINT SYSTEM

1.0 SCOPE

This is a global overview of the most important factors which must be adhered to in the surface protection of all rolling stock.

2.0 SURFACE PREPARATION

2.1 Blast cleaning. (Air supply 550 -700 kpa)

2.1.1 Blast cleaning must not be done out-of-doors in inclement weather or when there is dew or condensation on the metal or when the atmospheric humidity is such that moisture condenses at the nozzle during the operation. Blasted surfaces left for any length of time and which show visible signs of oxidation under 10 x magnification, must be re-blasted before priming. Surfaces not prime coated during the same shift must be re-blasted.

2.1.2 Ensure that the following has been removed before blast cleaning:-

- all sharp edges, roughness and welding flux on welded seams and welding splatter
- all oil, grease and other contamination using solvents and wetting agents
- all heavy loose scale and rust.

2.1.3 Air supply that is used must show no signs of water or oil when the air is sprayed for 15 seconds onto a clean dry metal plate. This test must be done at the beginning of every shift.

2.1.4 All blast cleaned surfaces must have a surface cleanliness in accordance with the International Standard, ISO 8501-1, Grade Sa 2½. Inspect the blast cleaned surface for misses and or shadowing and re-blast where necessary. A reference method must be on hand to verify the surface cleanliness. (e.g. ISO 8501-1)

2.1.5 A profile height of between 40µm and 60µm must be attained. A process must be developed that will ensure that the specified profile height is maintained. This process must be controlled at all times.

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2.1.6 Remove all blasting dust, debris and residues preferably by vacuum cleaning or otherwise by using a clean dry brush and clean dry compressed air.

2.2 Power tool cleaning.

2.2.1 Remove all grease, oil and water-soluble salts.

2.2.2 Using hammers, wire brushes, power tools and any special tools required for the job, remove all loose scale, rust, welding flux/splatter and loose paint work, etc., taking special care to remove these products from rivets, welds and crevices.

2.2.3 As sanding machines release oil, it is necessary to degrease the surface after the sanding and cleaning operations.

2.2.4 Wash the complete surface down with a rinsing solution containing an approved corrosion inhibitor. Please note that water without a rust inhibitor must not be used.

2.3 Wet sanding.

2.3.1 Remove all surface contamination.

2.3.2 Sand down any dent filler that has been applied (see clause 3.0) to a smooth surface ensuring that all grinding marks and imperfections are removed.

2.3.3 All surfaces must be sanded uniformly dull to ensure a sound surface for the new paint scheme to adhere to.

2.3.4 As sanding machines release oil, it is necessary to degrease the surface after sanding and cleaning operations.

2.3.5 Wash the complete surface down with a rinsing solution containing an approved corrosion inhibitor. Please note that water without a rust inhibitor must not be used.

3.0 FILLING

3.1 All large imperfections such as porous welds, dents, undercuts, etc., must be filled with metal surface dent filler. Please note that filler must not be applied to the complete area to smooth out the usual peaks and valleys.

4.0 PRIMER COATING

4.1 The blast cleaned surfaces must be examined before applying the primer. Ensure that the surfaces have a surface cleanliness grade of Sa 2½. In the event

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that the surface no-longer have a cleanliness of Sa 2½, the complete area must be re- blast cleaned. (A light blast will only be required).

4.2 All bare metal exposed during power tool cleaning and wet sanding, must be prime coated with one coat primer to a wet film thickness of 140µm. This must be done before any oxidation takes place.

5.0 TREATMENT OF NEWLY MANUFACTURED STEEL BODY COMPONENTS PRIOR TO FITTING

5.1 All newly manufactured steel body components must be blast cleaned to a surface cleanliness in accordance with the International Standard, ISO 8501-1, Grade Sa 2½.

5.2 Apply one coat primer to a minimum wet film thickness of 140µm. Please note that both sides of the components/material must be prime coated.

6.0 FINAL COATING

6.1 Apply one coat of top paint, in accordance with this specification, to a minimum wet film thickness as per this specification.

6.1.1 A process must be developed that will ensure that the dry film thickness specified, will be attained. This process must be controlled at all times.

7.0 TESTS AND INSPECTION

7.1 Every stage of the surface protection process must be inspected and the work must not proceed to the next stage before it has been passed by Transwerk Quality Control. All inspection reports (filled in and signed off) must be submitted to Rolling Stock Quality Assurance who reserves the right to reject rolling stock which is not accompanied with the required paint inspection reports.

8.0 GENERAL CONDITIONS / REMARKS DURING THE SURFACE PROTECTION PROCESS

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8.1 No paint work must be undertaken out of doors in windy or rainy conditions or when the ambient and working surface temperature is below 8°C or above 38°C when the dew point is at least 5 °C less than the surface temperature and at relative humidity of up to 80% and when the dew point is at most 22 °C less than the ambient temperature at a relative humidity of down to 0%.

8.2 All paint system's batch (lot) numbers, expiry dates and weather conditions i.e., humidity reading, air temperature, surface temperature and dew point, must be recorded. This is of utmost importance for when problems with paint system are referred back to the supplier.

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PART 9.

SPECIFICATION FOR WATER JET AND DEGREASED PRIMER

1.0 SCOPE

This specification covers the requirements for a pure acrylic water based shop & travel primer coating for the protection of Transnet's rolling stock. The primer is formulated specifically for hydraulic spray application to rolling stock and rolling stock components. It forms the shop & travel primer of the rolling stock paint system followed by primer coating, emulsion, high build rust inhibitive conforming to Part - 3 of this specification.

The primer must be applied at ambient and surface temperatures between 5° C and 38° C, when the dew point is at least 5° C less than the surface temperature and at relative humidity of up to 80 %, and when the dew point is at most 22 ° C less than the ambient surface temperature at a relative humidity of down to 0 %.

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2.0 COMPOSITION

The primer must be a single pack pure acrylic dispersion type, containing non-toxic rust inhibitive pigments. The primer must be supplied ready for use by airless application and must be formulated to be flash rust resistant. It must comply with the performance requirements which are specified below when applied at a minimum dry film thickness of 15 micrometers over metal surfaces cleaned and treated in accordance with Part -8 of this specification.

2.1 Binder.

The binder shall be a pure acrylic dispersion with less than 1% free monomers and must have not less than 42% solids by weight.

2.2 Pigment.

The pigment must consist of recognised rust Inhibitive pigments together with the necessary inert fillers, tinting pigments and anti-settling agents.

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2.3 Toxicity.

The primer must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following :-

- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Shall contain no formaldehyde.
- Shall contain no Alkyl Phenols
- Shall contain no Chloro iso thymol

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3.0 QUANTATIVE REQUIREMENTS

The primer must conform to the requirements of Table 1.

Table 1 - Quantitative Requirements

CLAUSE	PROPERTY	UNIT	LIMITS		TEST METHOD
			min	max.	
3.1	Volume solids	%	38	-	ASTM D2697
3.2	Fineness of grind	μ	-	15	SABS ISO 1524
3.3	Drying time : Surface	h	-	0,5	5.1 hereof
	: Dry to handle	h	-	1	
	: Hard Dry	h	-	2	
3.4	Recoating time	h	-	2	5.2 hereof
3.5	pH		4,5	10	Potentiometric
3.6	Resistance to impact (direct)	J	5,0	-	5.3 hereof
3.7	Pinholes		Pinhole system	free	5.13 hereof
3.8	Min. film forming temp.	°C	3	-	5.14 hereof

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4.0 QUALITATIVE REQUIREMENTS

The primer must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
4.1	Condition in container	5.12 hereof
4.2	Storage stability 12 months from delivery date	Supplier to certify date of delivery on batch release certificate.
4.3	Spraying properties	5.4 hereof
4.4	Appearance	5.5 hereof
4.5	Sagging	5.6 hereof
4.6	Intercoat adhesion	5.7 hereof
4.7	Adhesion : i) To abraded steel ii) To weathered Emulsion & Polyurethane Acrylic system	5.8 hereof
4.8	Resistance to salt fog : Primer 100 hours	5.9 hereof
4.9	Flexibility (3 mm mandrill)	5.10 hereof
4.10	Freeze-thaw stability	SABS 1586-1995

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CLAUSE	PROPERTY	TEST METHOD
4.11	Colour: The colour of the primer must be a commercial match to red oxide according to A05 of SABS 1091-1975.	
4.12	Resistance to flash rusting	5.11 hereof

5.0 METHODS OF TESTING.

5.1 Drying time.

Follow test method according to SABS Method 148 with a mass of 4500 g.

Use a doctor blade to apply one coat at a wet film thickness of 70 - 80 micrometers. The film must be hard dry within 2 hours when tested

5.2 Recoating time.

When spray applied at a wet film thickness of 70 - 80 micrometer and allowed to dry for 1 hour according to SABS ISO 3270, the primer must be capable of being recoated with it self by hydraulic spray without development of any film defects after 1, 5 hours drying according to SABS ISO 3270.

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5.3 Resistance to impact.

Follow the procedure outlined in SABS Method 146. Apply the primer, using a doctor blade, at a wet film thickness of 70 - 80 micrometer. Age the panels for 7 days under standard conditions (SABS ISO 3270) before conducting the test with the painted side of the panel facing the plunger.

5.4 Spraying properties.

Follow test method in accordance with SANS 5044 / SABS 44 and apply the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment. An 020" adjustable tip must be used.

5.5 Appearance.

Spray apply a coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment with an 020" adjustable spray tip, to steel panels cleaned and surface prepared in accordance with Part - 8 of this specification. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

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5.6 Sagging.

5.6.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) by airless equipment a coat of primer to a wet film of 70 - 80 micrometers. Place the panel in a vertical position along its long edge and allow the primer to dry according to SABS ISO 3270, for two hours.

5.6.2 Criteria.

To pass this test, the paint must not sag. (A thick edge at the bottom of the panel is not considered as sag).

5.7 Intercoat adhesion.

5.7.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper.

5.7.2 Procedure Valid for 4 weeks from 2023-11-24T12:44:40+0200

Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to a test panel. A tip size of 0,020" must be used. Age the panel for 7 days under standard conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same primer to the panel as well as to a bare control panel. Again age for 7 days. Examine the panel for film defects and compare with the control panel.

Conduct the test on the test panel in accordance with specification SANS 2409.

5.7.3 Criteria.

There must be no difference in appearance between the two panels and the test panel must not show any signs of film defects such as blistering, wrinkling or loss of adhesion.

5.8 Adhesion.

5.8.1 Abraded steel.

5.8.1.1 Procedure.

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Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Abrade the panels with grade 180 abrasive paper. Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to the test panel., the tip size must be a 0,020 spray tip and age for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

5.8.1.2 Criteria.

There must be no loss of adhesion between the primer and the steel.

5.8.2 Weathered Emulsion and Polyurethane systems.

5.8.2.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514.

- One coat paint Emulsion, Semi Gloss in accordance with Part 5 of this specification.
- One coat Paint Polyurethane water based high gloss in accordance with Part 6 of this specification.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows :-

- 4 hours at 60°C UV and 4 hours at 40°C condensation cycle.

5.8.2.2 Procedure.

Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply one coat of the unthinned primer to a wet film thickness of 70 - 80 micrometers using suitable hydraulic spray equipment to the test panel. A tip size of 0,020” must be used. Age the panels for 7 days under standard conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

Examine for loss of intercoat adhesion between the two surfaces and compare the appearance with that of the control panel.

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5.8.2.3 Criteria.

There must be no loss of adhesion between the primer and the weathered coating system.

5.9 Resistance to salt fog.

5.9.1 Test panels.

Use four cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

5.9.3 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 micrometers.

5.9.3 Painting of panels.

Spray apply two coats of the unthinned primer to a wet film thickness of 70 - 80 micrometers each using suitable hydraulic spray equipment. A tip size of 0,020” must be used. Allow the first coat to dry for 2 hours before applying the second coat. Age the panels for 7 days at 23° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means. Prepare two additional panels as above but overcoat them after 24 hours by spraying with one coat of the same manufacturer’s finishing paints complying with Parts – 5 & 6 of this specification to a wet film thickness of 140 - 150 micrometers for Part 5 and 80 – 100 micronmetres for Part 6 of this specification.

5.9.4 Procedure.

Ensure that the dry film thickness of the test panels are between 15 and 30 micrometers for the primed steel panels and between 80 and 100 micrometers for the complete system. Using a sharp knife, diagonally score the panels through to bare substrate from all four corners. Expose the panels in a salt fog cabinet according to SABS ISO 1519 for the respective specified periods.

5.9.5 Criteria.

For the primer and complete paint system to pass this test, there must be no signs of rust except in the scribed lines. There must be no blistering or any other film

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defects and no rust creep or loss of adhesion more than 2 mm, average, on either side of the scribe lines of both the primed and complete paint system panels.

5.10 Flexibility.

Follow the procedure outlined in SABS ISO 1519. Apply the primer with a doctor blade having a clearance to obtain a dry film thickness of 20 micrometers. Let the primer dry for 24 hours at standard conditions (SABS ISO 3270) and stove for 24 hours in an oven at 90° C ± 2° C. Cool to room temperature within 15 minutes before conducting the test using a 3 mm mandrel.

5.10.1 Criteria.

For the primer to pass, no defects must be present.

5.11 Resistance to flash rusting.

5.11.1 Panels.

Use three clean mild steel panels 300 mm X 300 mm X 2 mm. Abrasive blast clean the panels to cleanliness of Sa 2½ in accordance with ISO 8501-01 with a maximum blast profile of 60 micrometers. Apply a coat of primer to the newly cleaned panels to a dry film thickness of 30 microns).

5.11.2 Exposure.

Expose the first panel under standard conditions in a constant temperature room (SABS ISO 3270) for 1 hour. Expose the second panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 38° C for 1 hour. Expose the third panel immediately in a humidity cabinet with a relative humidity of 80 % and a temperature of 8° C for 1 hour. Remove the panels and examine for any visible signs of flash rusting.

5.11.3 Criteria.

No evidence of flash rusting must be visible on either of the painted panels.

5.12 Condition in container.

In addition to the requirements of SABS Method 1524, the primer must be supplied ready for use in the containers without the need for straining to remove skins or coarse particles.

5.13 Pin holes.

5.13.1 Procedure.

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Prepare test panels according to clauses 5.9.1 to 5.9.3 of this specification. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

5.13.2 Criteria.

The complete paint system must be pinhole free.

5.14 Minimum film forming temperature (MFT).

5.14.1 Follow the test method as described in ASTM 2354.

5.14.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening / cracking or both.

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Annex No. 1 to Part - 9 of Specification RS/ME/SP/009

Product Qualification Certificate.

Primer Coating, De-Greased, Rust Inhibitive

Tenderer : _____ Certificate No. : _____

Manufacture: _____

Name of Material: _____

1. COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			

2. QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
2.1	Non-volatile content	% m/m			
2.2	Volume solids	%			
2.3	Fineness of grind	µm			
2.4	Drying Time: i) Surface ii) : Dry to handle iii) : Hard Dry	h h h			
2.5	Recoating time	h			
2.6	pH				
2.7	Resistance to impact (direct)	J			
2.8	Mass per litre	g			
2.9	Consistency	g			

3. QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance	
3.5	Sagging	
3.6	Inter coat adhesion	
3.7	Adhesion i) ii)	

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CLAUSE	PROPERTY	REMARKS
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour	
3.11	Resistance to salt fog : i) Primer, 250 hrs ii) System, 500 hrs	
3.12	Resistance to flash rusting	

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Valid for 4 weeks from 2023-11-24T12:44:40+0200

Signed: _____

Date: _____

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Batch control test certificate.

Primer Coating, De-Greased, Rust Inhibitive

Manufacturer: _____

Name of material: _____ **Batch No.:** _____

1. QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Non-volatile content	% m/m	
1.2	Volume solids	%	
1.3	Fineness of grind	µm	
1.4	Drying time : i) Surface ii) Hard	h h	
1.5	Recoating time	h	
1.6	pH		
1.7	Mass per litre	g	
1.8	Consistency	g	

2. QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance	
2.4	Sagging	
2.5	Colour	
2.6	Resistance to flash rusting	

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PART 10.

**SPECIFICATION FOR WATER-BASED, HIGH STRENGTH CLEANER AND
DEGREASER**

1.0 SCOPE

This specification covers the requirements for a heavy duty water-based cleaner and degreaser.

2.0 COMPOSITION

2.1 The High Strength Cleaner and Degreaser must be supplied in a water-based solution form. Active components of the degreaser must be biodegradable, environmentally friendly and non toxic.

2.2 The degreaser must contain suitable alkaline cleaning components.

2.3 Suitable non toxic, co-solvents, that aid degreasing properties, may be added up to levels of 10% by volume.

3.0 APPLICATION METHOD

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3.1 For heavy duty steel cleaning requirements the product will be used in the undiluted form.

3.2 The de-greaser will be applied at to surfaces using a brush, mop or pump-style sprayer.

3.3 The will be left on the substrate for \pm 5-10 minutes for product to penetrate grease and dirt.

3.4 The de-greasr will then be rinsed off by means of a high pressure water jet until a 'water break' free surface is attained..

3.5 The component de-greased will be prime coated immediately after the water rinse and drying of the surface.

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4.0 QUANTITATIVE REQUIREMENTS

Table 1 - Quantitative Requirements.

CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
4.1	PH Value		12	13.5	6.1
4.2	Cleaning efficiency		Complete removal of all oil and grease		6.2
4.3	Corrosiveness- no pitting, etching, discolouration of hot rolled steel components evident		No etching of surface		6.3

5.0 QUALITATIVE REQUIREMENTS

The Water-based High Strength Cleaner and De-greaser, must conform to the requirements listed in Table 2.

Table 2 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
5.1	Storage stability (12 months from date of delivery)	Supplier to certify date of delivery on batch release certificate
5.2	The Water Based Cleaner & Degreaser should not have an objectionable odour	

6.0 METHODS OF TESTING

6.1 PH TEST

Condition the sample to 23°C +- 2°C. Using a suitable PH Meter and electrode. Firstly calibrate using a PH 7 Buffer solution, then calibrate PH Meter using PH 10 buffer. To check PH ensure sample is homogeneous. Immerse electrode with

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temperature probe into the solution. Wait for 60 seconds then record the PH Value.

6.2 CLEANING EFFICIENCY

Use two hot rolled steel test panels of size 300mm x 200 mm x 3mm.

On the first panel, degrease as per manufacturers specification and process.

Rinse thoroughly with water, check 'water break' free surface is obtained.

On the second panel, soil with suitable selection of grease, oil, cutting fluids as used/approved in Transnet workshops. Degrease as per manufacturers specification. Rinse thoroughly, check 'water break' free surface is obtained. Then wipe surface with white cloth, check no oil or grease is evident.

6.3 CORROSIVENESS

Examine the panels cleaned and degreased in 6.2 above.

Check no evidence of pitting, etching, discolouration of hot rolled steel components evident.

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Annex No. 1 to Part - 10 of Specification RS/ME/SP/009

Product Qualification Certificate

Water Based, High Strength Cleaner and Degreaser.

Tenderer: _____

Manufacture: _____

Name of Material: _____

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	PH value		12	13.5	
1.2	Cleaning Efficiency				Complete removal of oils, grease, cutting fluids

Valid for 4 weeks from 2023-11-24T12:44:40+0200

2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	Storage stability 12 months from date of delivery

3.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

4.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed : _____

Date : _____

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PART 11

SPECIFICATION FOR PAINT, WATERBORNE POLYURETHANE, WATER BASED SYSTEM

1.0 SCOPE

This specification covers the requirements for a Waterborn, Polyurethane, Water Based, system of the colours specified in Table 1 for the exterior protection and decoration of Transnet's rolling stock. The materials must be supplied in dual containers and formulated specifically for hydraulic spray application to the exterior metal cladding of rail vehicles. (Air assisted Airless equipment will also be considered). It forms the top coat of the rolling stock paint system and will be applied over Primer coating, emulsion, high build, rust Inhibitive conforming to Part – 3 & 9 of this specification. It will be applied at ambient and surface temperatures between 8° C and 38° C, when the dew point is at least 5° C less than the surface temperature at a relative humidity of up to 80 %, and at most 22 °C less than the ambient surface temperature at a relative humidity of down to 10%. **Valid for 4 weeks from 2023-11-24T12:44:40+0200**

Table 1. Paint colours.

COLOUR	SPECIFICATION	USED
Graphite Grey	RAL 7024	Locos, Coaches & Wagons
Light Grey	RAL 7035	Locos, Coaches & Wagons
Traffic White	RAL 9016	Locos, Coaches & Wagons
Transnet Red	NCS S 1085-Y90R	Locos
Transnet Green	NCS S 4040-G70Y	Locos
Transnet Yellow	NCS S 1070-Y20R	Locos
Coach Yellow	RAL 075 70 60	Locos, Coaches & Wagons
Coach Turquoise	RAL 200 50 45	Coaches
Coach Purple	RAL 320 30 35	Coaches
Violet	B7-C-14	Locomotives
Plascothane Pure Orange	UP-7	Locomotives
French Grey	H30	Locomotives & Wagons
Pebble Grey	RAL 7032	Locomotives

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Light Brown	G379	Locomotives
Aqua Marine Blue	RAL 5002	Locomotives, Coaches
Blue Green	RAL 6004	Locomotives
Water Blue	RAL 5021	Locomotives, Coaches
TE Light Brown Velvaglo	TVW 2000	Locomotive Drivers Cab
French Grey	TWI 2000	Locomotive Engine Compartment

2.0 COMPOSITION

2.1 Base.

The base must consist of any suitable non-toxic, light and weatherfast pigments or mixture of pigments and extenders, tinting pigments and additives, supplied ready for use. It must comply with the performance requirements which are specified below when mixed with the curing agent and applied at a total minimum dry film thickness of 50 microns, over suitably primed metal surfaces.

2.1.2 Binders. Valid for 4 weeks from 2023-11-24T12:44:40+0200

The binders must consists of any suitable non-toxic, water soluble hydroxyl terminated polymer, having the necessary functional groups to react with the curing agent to give a product capable of meeting the performance requirements of this specification, provided the paint complies with the toxicity clause 2.5 below.

2.2 Curing agent.

The curing agent must be a linear aliphatic isocyanate, free of any un-reacted monomers. It must be mixable with water and capable of cross-linking with the binder resin at ambient temperatures of between 8 °C and 38 °C.

2.3 Special ingredients.

The addition of small quantities of grinding, wetting, stabilising, anti-settling and thickening agents is left to the desecration of the manufacturer.

2.4 Solvents.

The paint as supplied must contain not more than 4% non-toxic organic solvents.

2.5 Toxicity.

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The paint, after mixing, must contain not more than 1, 0 % by mass, calculated on the total composition, of any of the following:-

- Soluble heavy metals when determined in accordance with ISO 6713.2 and ISO 3856/1 to 6.
- Any known or suspected carcinogen as listed in the latest issue of ACGIH “Threshold limit values for chemical substances and substances and physical agents in the work environment”. Values published in regulations in terms of the Act 85 of 1993, will take precedence over those of the ACGIH.
- Any volatile organic solvents with a TLV-TWA below 100 ppm.
- Must contain no formaldehyde.
- Must contain no Alkyl Phenol
- Must contain no Chloro iso thymol

3.0 MIXING RATIO

The mixing ratio of base to curing agent must be a simple ratio by weight or volume. (Whole numbers).

4.0 QUANTITATIVE REQUIREMENTS

The paint when mixed in the required ratio must conform to the requirements of Table 2.

Table 2 - Quantitative Requirements.

CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
4.1	Volume solids	%	40	-	ASTM D2697
4.2	Fineness of grind	μ	-	15	SABS ISO 1524
4.3	Drying time : Surface : Hard	h	-	1 4	7.3 hereof
4.4	Masking time	h	-	8	7.4 hereof
4.5	Recoating time	h	-	0,5	7.5 hereof
4.6	Gloss at 60°		80	85	7.6 hereof
4.7	pH		7,5	8,5	Potettionmetric
4.8	Resistance to scratching	g	2000	-	7.7 hereof
4.9	Pin holes				7.8 hereof
4.10	Minimum film forming temp.	°C	-	3	7.9 hereof
4.11	Sword Rocker Hardness 23 °C		50	-	7.18 hereof

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CLAUSE	PROPERTY	UNITS	LIMITS		TEST METHOD
			MIN	MAX.	
	60° C		25	-	

5.0 QUALITATIVE REQUIREMENTS

The paint, when mixed, must conform to the requirements listed in Table 3.

Table 3 - Qualitative Requirements

CLAUSE	PROPERTY	TEST METHOD
5.1	Storage stability (12 months from date of delivery)	Supplier to certify date of delivery on batch release certificate
5.2	Spraying properties	7.2 hereof
5.3	Pinholes	7.8 hereof
5.4	Minimum film forming temperature	7.9 hereof
5.5	Appearance and opacity	7.10 hereof
5.6	Sagging	7.11 hereof
5.7	Intercoat adhesion	7.12 hereof
5.8	Adhesion to weathered coating systems	7.13 hereof
5.9	Resistance to accelerated weathering 500 hours	7.14 hereof
5.10	Flexibility (3 mm mandrill)	7.15 hereof
5.11	Washing and Cleanability	7.16 hereof
5.12	Condition of container	7.17 hereof

6.0 COLOUR

The colour of the paint film must be uniform and must match the colour as specified in Table 1. The colour must not deviate more than 0, 5 ΔE when measured on an ACS colour computer according to SABS ISO 7724.

7.0 METHODS OF TESTING

7.1 Pot life.

Condition the unmixed paint at a temperature of between 22 °C and 24 °C.

Mix 500 ml of paint as per clause 3 above. Allow a period of 10 minutes for induction. Thin the paint down with water to attain a viscosity of between 40 and 45 seconds, Ford Cup 4. The efflux viscosity of the paint must not increase to

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more than 75 seconds after 3 hours. The test must be done at an atmospheric temperature of 23 °C in an open container.

7.2 Spraying and recoating properties.

Mix and thin the paint as per clause 7.1 above. Clean and degrease a glass panel of approximate size 150 mm x 450 mm x 6 mm. The test panel must be completely dry. Place the test panel in a vertical position in the spray booth. Spray apply the first coat of paint to a wet film thickness of 25 - 51 microns. Allow a flash off time of ± 20 minutes. Spray applies a second coat of paint to a wet film thickness of 51 - 76 microns. The spray application must be done using suitable hydraulic spray equipment. Allow the paint to dry at 23 °C ± 2 °C for 8 hours. (SABS Method 3270)

7.2.1 Criteria.

Upon drying, the paint film must be uniform and glossy free from runs, sags, bloom, excessive orange peel, wrinkling, pinholes or any other defects.

7.3 Drying time. Valid for 4 weeks from 2023-11-24T12:44:40+0200

Follow test method for Surface Hard, SANS 176 & Hard Dry, SANS 5148 but use a doctor blade to apply one coat at a wet film thickness of 51-76 microns.

7.4 Masking time.

Mix and apply the paint as per clause 7.2 above to suitable glass panels. Allowed to dry for 4 hours under standard test conditions (SABS ISO 3270), the coating must be suitable for masking with Tape, Pressure Sensitive Adhesive, Masking, Smooth Tape. The following test must be conducted at 23° C :

Place the tape flat onto the panel and pass a roller of 2 kg mass having a width of ± 64 mm once over the masking tape at a rate of ± 300 mm per minute.

Leave the tape on the surface for 1 hour and then strip the tape from the panel.

Leave panel for ± 30 minutes to allow paint to recover before inspecting the paint film.

7.4.1 Criteria.

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The masking tape must not mark the painted surface in any way and any residual adhesive must be removable by light rubbing with a cloth moistened with white spirits without any visible damage to the paint.

7.5 Recoating time.

When spray applied at a total wet film thickness of 76 - 127 microns as per clause 7.2 above and allowed to dry under standard test conditions for 0,5 - 1 hour according to SABS ISO 3270, the paint must be capable of being recoated by itself using hydraulic spray application without development of any film defects. After 8 hours drying (according to SABS ISO 3270) the film must be hard dry when tested according to SABS Method 148 with a mass of 1 200 g.

7.6 Gloss.

Follow the procedure as outlined in ISO 2813-1994, but apply two coats of the thinned paint as per clause 7.2 above onto a smooth glass panel of size 70 mm x 150 mm x 3 mm. Allow to dry at standard drying conditions for 8 hours. Weather the panel for 20 hours in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 according to the following cycle:

- 4 hours UV exposure at 60° C
- Followed by 4 hours condensation exposure at 40 ° C.

7.7.2 Criteria.

The gloss reading must be measure at a 60° head after the first 8 hours of drying as well as after 20 hours of exposure, all readings obtained must between 80 - 85.

7.7 Resistance to scratching.

Follow the procedure outlined in SABS 147. The paint must be applied by means of a doctor blade to give a dry film thickness of 50 to 60 microns and aged for 7 days under standard test conditions (SABS ISO 3270). Measure and record the dry film thickness.

7.7.1 Criteria.

Report the minimum mass load required to penetrate through the coating to expose the bare steel.

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7.8 Pin holes.

7.8.1 Test Panels.

Use two cold rolled steel test panels conforming to SABS ISO 1514 and of size 70 mm X 150 mm X 1,5 mm.

7.8.2 Preparation of panels.

Abrasive blast the panels as described in sub-clauses 7.2.1 and 7.2.2 of specification SABS 801 but ensure that the maximum profile height does not exceed 50 microns.

7.8.3 Painting of panels.

Spray apply one coat of the unthinned primer coating conforming to “Part - 3” of this specification and two coats of the thinned top coat as per clause 7.2 of this specification each using suitable hydraulic spray equipment. Age the panels for 7 days at 23° C and relative humidity of 50 %, during which period their backs and edges are to be sealed by suitable means.

7.8.4 Procedure. valid for 4 weeks from 2023-11-24T12:44:40+0200

Ensure that the dry film thickness of the panels is between 100 and 120 micrometers for the complete system. Use a low voltage holiday (pore) detector, such as the Elcometer pin hole detector to examine the film for any defects.

7.8.5 Criteria.

The complete paint system must be pinhole free.

7.9 Minimum film forming temperature (MFT).

7.9.1 Follow the test method as described in ASTM 2354.

7.9.2 Criteria.

The MFT must be at least down to 3 °C. Report the MFT in °C and describe the discontinuity e.g. whitening or cracking or both.

7.10 Appearance and opacity.

7.10.1 Procedure.

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Spray apply two coats of the thinned paint as per clause 7.2 of this specification, to slightly sanded primed steel panels as well as a Morest hiding power chart. On drying under standard conditions according to SABS ISO 3270, the film must be uniform with no evidence of runs, sags, flash rusting or any other visual defects.

7.10.2 Criteria

When the paint is applied as above to the Morest hiding power chart the dry film must completely hide the black and white stripes on the chart.

7.11 Sagging.

7.11.1 Procedure.

Spray apply onto a glass panel (300 mm X 400 mm) two coats of the thinned paint as per clause 7.2 of this specification. Place the panel in a vertical position along its long edge and allow the paint to dry according to SABS ISO 3270, for two hours.

7.11.2 Criteria Valid for 4 weeks from 2023-11-24T12:44:40+0200

To pass this test, slight thickening of the lower horizontal edge will be tolerated provided that :

- No tearing or curtaining is evident.
- There is no film slumping or reduction of film thickness which can be identified by loss of opacity just below the top horizontal line.

7.12 Intercoat adhesion.

7.12.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm x 150 mm x 0,8 mm as described in SABS ISO 1514. Abrade the panel with grade 180 abrasive paper.

7.12.2 Procedure.

Apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panel for 24 hours under standard test conditions (SABS ISO 3270). Wet sand one half of the panel with grade 180 abrasive paper until the painted surface is smooth and dull. Apply a second coat of the same paint to this panel as well as to

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a bare control panel. Again age for 24 hours. Examine the panel for film defects and compare with the control panel. Conduct the following test on the test panel:-
Conduct the test on the test panel in accordance with specification SANS 2409.

7.12.3 Criteria.

There must be no loss of intercoat adhesion. The first coat must be sufficiently softened to give a good bond with the second coat but must not be disturbed, wrinkled, dissolved or show any defect on application of the second coat. On drying there must be no difference in the appearance of the second coat when compared to the control panel.

7.13 Adhesion to weathered water based coating systems.

7.13.1 Test panels.

Use cold rolled steel test panels of approximate size 70 mm X 150 mm X 0,8 mm as described in SABS ISO 1514. Spray the panels with a emulsion acrylic system as follows:-

- First coat - One coat Primer Coating, Emulsion, High Build, Rust Inhibitive in accordance with Part - 3 of this specification.
- Second coat - One coat Paint, Emulsion, Semi-Gloss in accordance with Part - 5 of this specification.

The colour must be contrasting to that of the paint being tested.

Age panels for 7 days during which period, their backs and edges are to be sealed by suitable means. Weather the panels for 300 hours in a fluorescent UV condensation weathering apparatus as described in ASTM G53 as follows:-

- 4 hours at 60°C UV
- And 4 hours at 40°C condensation cycle.

7.13.2 Procedure.

Wet abrade the weathered panels with grade 180 abrasive paper to a smooth dull surface. Remove all loose dirt from the top coats by washing with clean water. Apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panels for 7 days under standard test conditions (SABS ISO 3270).

Conduct the test on the test panel in accordance with specification SANS 2409.

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7.13.3 Criteria.

There must be no loss of adhesion between the paint and the weathered coating system.

7.14 Resistance of accelerated weathering.

7.14.1 Test panels.

Use four “water-break-free” aluminium test panels of suitable size and spray apply one coat of the same manufacture’s primer complying to Part - 3 of this specification at a wet film thickness of 130 - 150 microns to two panels. Allow to dry for four hours at standard test conditions. Spray apply two coats of the thinned paint as per clause 7.2 of this specification. Age the panels for seven days at standard test conditions. Measure and record the gloss reading at a 60° head.

7.14.2 Procedure

Expose one system panel and one finishing coat panel in a Fluorescent UV-Condensation Type weathering apparatus as described in ASTM G53 and operate according to the following cycle for the specified period : four hours UV exposed at 60°C and four hours condensation exposure at 40° C. Retain the other two panels for control purposes.

7.14.3 Regular inspections must be carried out during the exposure period and a through examination, in comparison with the control panel must be done at the end of the test in accordance with SABS ISO 4628.

7.14.4 Criteria.

During or at the end of the exposure period, the paint film shall:

- Show a minimum of chalking (equivalent to rating 2 of SABS ISO 4628-6) and no evidence of alligating, checking, blistering or any other defects.
- Have a colour change equivalent to a lightness difference (ΔL) of less than four units when tested according to specification SABS ISO 7724-1/2.
- Have a loss of gloss of not more than 50% of the original gloss measured before exposure.

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7.15 Flexibility.

7.15.1 Procedure.

Follow the procedure outlined in SABS ISO 1519. Apply the paint with a doctor blade having a clearance of 150 microns. Age for 7 days under standard conditions, SABS ISO 3270. Conduct the test using a 3 mm mandrel.

7.15.2 Criteria.

The paint film when bent through 180° over a 5 mm mandrel must show no cracks or any other defects under 10 x magnification.

7.16 Washability and Cleanability.

7.16.1 Procedure.

Prepare two panels according to SABS ISO 1258 for the washability and two glass panels for the cleanability tests. Apply two coats of the thinned paint as per clause 7.2 of this specification. Allow the panels to dry for 7 days according to SABS ISO 3270.

7.16.2.1 Procedure: Washability.

Follow the method as described in SABS Method 1258.

7.16.2.2 Procedure: Cleanability.

Expose the two glass panels at 60 °C in an oven for 30 minutes. During this time, soil half of the painted surfaces of the panels with A4 carbon black pigment by using a circular motion of a finger until an even heavy stain of the surface has been obtained. Leave for a further 30 minutes. Remove the panels from the oven and blow off the excess pigment and allow the panels to reach room temperature. Subject the panels to the cleanability test as described in SABS Method 1258. Note how many oscillations are necessary to remove the carbon black contaminant.

7.16.3.1 Criteria: Washability

The paint film must withstand 200 wet-scrub cycles according to SABS Method 1258 with an average loss in coating thickness of less than 70 microns.

7.16.3.2 Criteria: Cleanability.

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The contaminant must be removed so that the previously contaminated surface is indistinguishable from the uncontaminated surface after no more than 30 oscillations.

7.17 Condition in container.

In addition to the requirements of SABS ISO 1524, the paint must be supplied ready for use in the container without the need for straining to remove skins or coarse particles. The consistency of all batches of one colour must be uniform batch to batch when the paint is at 23 °C.

The consistent every batch must be measured, SABS 153 after mixing and noted for later reference.

7.18 Sward Rocker Hardness.

7.18.1 Procedure. Valid for 4 weeks from 2023-11-24T12:44:40+0200

Using a doctor blade, apply one coat of paint to a wet film thickness of 51-76 microns to suitably sized water-break free glass panels. Allow the panels to dry under standard conditions, SABS ISO 3270, for 48 hours. Thereafter, place the panels in an oven at 60 °C for 3 hours. Remove and allow cooling.

Determine the sward rocker hardness at 23 ± 2 °C according to ASTM D2134. Expose the panels at 60 °C in an oven for 30 minutes and determine the hardness at 60 °C. Conduct the 60 °C test inside the oven but be sure that the vibration or air circulation of the oven fan does not affect the test.

7.18.2 Criteria.

The sward rocker hardness at 23 °C must be at least 50 oscillations and at 60 °C must be at least 25 oscillations.

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Product Qualification Certificate

Paint, Two Pack Polyurethane, Water Based.

Tenderer: _____

Manufacture: _____

Name of Material: _____

(Copies of this form must be used for each of the respective colours)

1.0 COMPOSITION

CLAUSE	PROPERTY	UNITS	MIN	MAX.	TYPICAL
1.1	Pigment content	% m/m			
1.2	Non-volatile vehicle content	% m/m			
1.3	Pigment volume concentration	%			
1.4	Pigment composition				

2.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	MIN	MAX	TYPICAL
2.1	Volume solids	%			
2.2	Fineness of grind	µm			
2.3	Drying Time: i) Surface ii) Hard	h h			
2.4	Recoating time	h			
2.5	pH				
2.6	Recoating time	h			
2.7	Masking time	h			
2.8	Consistency (unthinned paint at 23°C ± 2°C.	g			
2.9	Gloss				
2.10	Resistance to scratching	g			
2.11	Mass per litre	g			
2.12	Pinholes				
2.13	Sword Rocker hardness i) 23°C ii) 60° C				

3.0 QUALITATIVE REQUIREMENTS

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CLAUSE	PROPERTY	REMARKS
3.1	Condition in the container	
3.2	Storage stability	
3.3	Spraying properties	
3.4	Appearance and opacity	
3.5	Sagging	
3.6	Adhesion: Weathered coating systems	
3.7	Intercoat adhesion i)	
	ii)	
3.8	Flexibility	
3.9	Freeze-thaw stability	
3.10	Colour No.	
3.11	Resistance to accelerated weathering	
	i) film defects	
	ii) Lightness difference	
	iii) Percentage loss of gloss	
3.12	i) Washability (loss in thickness after 200 wet-scrub cycles)	
	ii) Cleanability (no. of wet-scrub cycles to remove soil)	

Valid for 4 weeks from 2023-11-24T12:44:40+0200

4.0 COMPLIANCE WITH SPECIFICATION

It is hereby certified that the materials offered comply with all the requirements of this specification.

5.0 APPROVAL OF FACTORY

It is hereby certified that the factory in which the products offered are to be manufactured, has been inspected and approved for this purpose by Transnet.

Signed : _____

Date : _____

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Annex No. 2 to Part - 11 of Specification RS/ME/SP/009

Batch control test certificate.

Paint, Two Pack Polyurethane, Water Based.

Manufacture : _____

Name of material: _____ **Batch No.:** _____

Batch size : _____

1.0 QUANTITATIVE REQUIREMENTS

CLAUSE	PROPERTY	UNITS	REMARKS
1.1	Fineness of grind	µm	
1.2	Drying time : i) Surface ii) Hard	h	
		h	
1.3	Recoating time	h	
1.4	pH		
1.5	Mass per litre	g	
1.6	Consistency (unthinned paint at 23 °C ± 2 °C)	g	
1.7	Masking time	h	
1.8	Gloss i)		
1.9	Sword Rocker hardness i) 23 °C ii) 60° C		

2.0 QUALITATIVE REQUIREMENTS

CLAUSE	PROPERTY	REMARKS
2.1	Condition in the container	
2.2	Spraying properties	
2.3	Appearance and opacity	
2.4	Sagging	
2.5	Colour	

PART 12

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Paint Remover

Clause	Description																		
1.0	Scope																		
1.1	This specification has been written for paint remover. This is a water based remover that is biodegradable user friendly and environmentally friendlt.																		
2.0	<ul style="list-style-type: none"> • Water Based • Fully biodegradable • Non-flammable • Contains no Toxic / Hazardous Air Pollutants • Contains no methylene • Easy clean up with running water • Non Ozone depleting 																		
2.1	<div style="text-align: center; color: red; font-weight: bold; font-size: small;">Valid for 4 weeks from 2023-11-24T12:44:40+0200</div> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">• Apperance</td> <td>Emulsion</td> </tr> <tr> <td>• Colours</td> <td>Any Colour</td> </tr> <tr> <td>• Flash Point</td> <td>N/A</td> </tr> <tr> <td>• Boiling Point</td> <td>N/A</td> </tr> <tr> <td>• pH</td> <td>3.5 – 4.5</td> </tr> <tr> <td>• VOC</td> <td>444 g/l (Theoretical)</td> </tr> <tr> <td>• Density</td> <td>1.05 g/ml</td> </tr> <tr> <td>• Viscosity</td> <td>107 KU</td> </tr> <tr> <td>• Shelf Life</td> <td>24 Months</td> </tr> </table>	• Apperance	Emulsion	• Colours	Any Colour	• Flash Point	N/A	• Boiling Point	N/A	• pH	3.5 – 4.5	• VOC	444 g/l (Theoretical)	• Density	1.05 g/ml	• Viscosity	107 KU	• Shelf Life	24 Months
• Apperance	Emulsion																		
• Colours	Any Colour																		
• Flash Point	N/A																		
• Boiling Point	N/A																		
• pH	3.5 – 4.5																		
• VOC	444 g/l (Theoretical)																		
• Density	1.05 g/ml																		
• Viscosity	107 KU																		
• Shelf Life	24 Months																		
2.2	Mixing Details																		
2.1	Stir thoroughly with a drill mixer until product is uniform in colour and is creamy in Consistency. (About 1 minute per litre).																		
2.2	Any painted steel, metal alloys and plastic.																		

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2.3 Brush, roller or airless spray application. Roller application used only for horizontal Surfaces. Use only airless equipment with chemical resistant components, such as HERO 85 SEL or a larger pump. Equip the sprayer with a tip size of 0.019 inches or larger.

3.0 Storage & Packaging

3.1 Store away from direct sun, heat and severe cold.

Packaging: 3 l and 20 l

4.0 Application

- 4.1**
- **TEST PATCH:** Conduct a small test patch in an inconspicuous area to ensure product performance. This will indicate the time required for project completion, suitability of product for paint and substrate, and most effective removal method.
 - Apply a thick even layer of onto the coating. The layer should be thick enough to hide the surface colour of the coating. Apply using a stainless steel or plastic sprayer, brush or roller.
 - On thick coatings or glossy/greasy vertical surfaces, remove coating in two separate applications.
 - First apply a light coat of approximately 0.5mm, and allow it to dwell for 5-30 minutes. Then build the rest of the remover film thickness in a second application.
 - Once applied leave the remover alone, as agitation slows down penetration.
 - The time required for penetration varies according to the type of paint, and the temperature. Most paint systems require between 2 to 36 hours. Can be left overnight, but do not allow it to dry out.
 - Remove lifted paint by scraper, squeegee, wet/dry vacuum suction system or high pressure (2500 – 3500 psi). Water wash. Be careful if using a high pressure washer on porous surfaces as it can harm the surface. Pressure wash from bottom up on vertical surfaces to prevent rinse water from

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deactivating remover in sections below. The treated surface must be rinsed with water to remove all chemical residues before repainting.

- Clean spray equipment by running water through the equipment as soon as the spraying has been completed.
- **RE-APPLICATION:** When there are multiple layers of paint it is possible that there is poor inter-coat adhesion between some layers. Premature lifting may occur at this interface. If this happens, remove the lifted layers and re-apply the remover. Do not rinse with water between applications. Do not allow remover to dry out. The remover is designed to remain wet and effective over extended periods of time (up to 48 hours), but excessive sunshine, windy conditions or insufficient remover thickness can cause early drying. If the remover starts to dry, re-apply a light coating and allow extra time for completion.

4.2 Safety Precautions

- 4.2.1
- Always keep remover out of reach of children.
 - Ensure good ventilation during application.
 - Wear protective gloves and goggles while applying.
 - If accidental contact with skin should occur, wash immediately with soap and water or a recognised skin cleaner.
 - Take care to avoid contact with the eyes. In case of contact, immediately rinse the eyes with plenty of water and seek medical attention.
 - Harmful if swallowed. Seek medical attention and do not induce vomiting.
 - Store in a cool, dry place away from heat and sparks.
 - Refer to Material Safety Data Sheet for complete information

Part 13

Paint Thinners (Nitrocellulose)

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- | Clause | Description |
|------------|---|
| 1.0 | Scope |
| 1.1 | Thinners, Epoxy Thinners, Lacquer Polyurethane, PVC, |
| 2.0 | Composition / Precautions |
| 2.1 | <ul style="list-style-type: none"> • A volatile, intoxicating liquid. Proper ventilation or protection against the inhalation of vapours is extremely necessary. • A highly flammable liquid. Suitable precautions must be taken to avoid build-up of vapours, especially in confined spaces. |

3.0 Description

- 3.1 A colourless, volatile, flammable solvent of petroleum or synthetic petroleum origin, consisting of a complex of hydrocarbons.

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4.0 Application and Use

- 4.1 Thinning of alkyd based paints, undercoats, varnish, Polyurethane oil modified varnish, bituminous coatings and linseed oil and general use as a cleaning solvent.

5.0 Properties

5.1	Properties	UNIT	MIN	MAX
	Distillation: Recovery to 155 °C	% v/v	-	10
	Recovery to 195 °C	% v/v	90	-
	Dry Point	°C	-	205
	Aromatic Content	% v/v	15	25
	Flash Point	°C	34	-

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6.0 Remarks

6.1 Although of low toxicity, good ventilation is advisable. Treat as a FLAMMABLE liquid.

Mineral Turpentine (White Spirit)

1.0 Description

1.1 A colourless volatile flammable solvent of petroleum or synthetic petroleum origin consisting of a complex mixture of hydrocarbons.

2.0 Applications and Use

2.1 Thinning of alkyd based paints, undercoats, varnish, Polyurethane oil modified varnish, bituminous coatings and linseed oil and general use as a cleaning solvent.

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3.0 Properties

3.1

Properties	UNIT	MIN	MAX
Distillation: Recovery to 155 °C	% v/v	-	10
Recovery to 195 °C	% v/v	90	-
Dry Point	°C	-	205
Aromatic Content	% v/v	15	25
Flash Point	°C	34	-

4.0 Remarks

4.1 Although of low toxicity, good ventilation is advisable. Treat as a FLAMMABLE liquid.

Xylene

1.0 Description

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1.1 A clear volatile toxic flammable liquid consisting of the three isomers of xylene which is an aromatic hydrocarbon

2.0 Applications and Use

2.1 Thinning of Chlorinated Rubber Paint, Traffic Paint, Aluminum and Black Heat Resistant Paint. Cleaning of equipment with which paint, modified Polyvinyl Chloride, High Build and Paint, Polyvinyl Chloride Copolymer, High Build spray.

3.0 Properties

3.1	Properties	UNIT	MIN	MAX
	Boiling Point	°C	-	160
	Flash Point	°C	23	-

4.0 Remarks

4.1 Although of low toxicity, good ventilation is advisable. Treat as a FLAMMABLE liquid.

Thinner, Polyurethane Acrylic

1.0 Description

1.1 A thinner of specified composition. (See Table)

2.0 Applications and Use

2.1 Thinning of Polyurethane Acrylic Coatings

3.0 Properties

3.1	Properties	UNIT	MIN	MAX
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Methyl Ethyl Ketone (MEK)	% by mass	12	15
Methyl Iso-Butyl Ketone (MIBK)	% by mass	19	21
Butyl-1-o1 (n- Alcohol)	% by mass	6	8
Toluene	% by mass	-	25
Xylene	% by mass	-	38
Water	% by mass	-	0,5

4.0 Remarks

4.1 Although of low toxicity, good ventilation is advisable. Treat as a FLAMMABLE liquid.

- 4.2
- A volatile highly flammable liquid. Precautions must be taken against build-up of vapours especially in confined spaces.
 - Detrimental to health when inhaled in large quantities. Avoid inhalation. Ensure that adequate ventilation is maintained during use.

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Thinner, Epoxy

1.0 Description

1.1 A thinner of specified composition. (See Table)

2.0 Applications and Use

2.1 Thinning of epoxy-based coatings namely, Primer Coating, Epoxy Zinc Rich, Rust Inhibitive, Epoxy, Two Pack, Filler, Dent, Metal Surface Spraying, Coating Compound, Coal Tar Epoxy.

3.0 Properties

3.1	Properties	UNIT	MIN	MAX
	Toluenen	% by mass	30	36

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4-Methylpentan-2-one (MIBK) and Butanone (MEK)	% by mass	16	18
Cyclohexethyl Acetate, Propane-2-o1	% by mass	16	18
Butan-1-o1	% by mass	6	7
Acetone	% by mass	5	6
2-Butoxyethanol	% by mass	20	22
Water	% by mass	-	0,5

4.0 Remarks

4.1 Although of low toxicity, good ventilation is advisable. Treat as a FLAMMABLE liquid.

- 4.2
- A volatile highly flammable liquid. Precautions must be taken against build-up of vapours especially in confined spaces.
 - Detrimental to health when inhaled in large quantities. Avoid inhalation.
- Ensure that adequate ventilation is maintained during use.

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