



**BEML  
LIMITED  
BANGALORE**

DRCA No.	MRS1/IE.10.00/M/B008/A2
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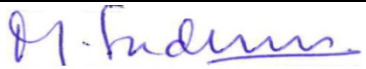


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**MRS1 Project  
Painting Specification**

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## 1. INTRODUCTION

This document describes the painting specification to be followed for painting of under frame, bogie frame & bogie equipments, GFRP Interior panels of both saloon and cab, electrical equipments, doors, exterior cab mask and cab skirt of Driving Motor Car (DMC), Motor car (MC) and Trailer car (TC) for MRS1 Project.

## 2. TRAIN CONFIGURATION


The basic train configuration of MRS1 project consists of two Driving Motor cars (DMC) cars, two Trailer cars (TC) and two Motor cars (MC).

The train configuration of 6 car formation will be: DMC-TC-MC-MC-TC-DMC

## 3. APPLICABLE STANDARDS & NORMS

Sl No.	Standard/Code	Title
1	EN 45545	Railway Applications - Fire Protection on railway vehicles
2	BS 3900 E2	Methods of test for paints-Scratch test
3	BS AU 148-15	Methods of test for motor vehicle paints. Resistance to chipping
4	BS 3900 E7	Methods of test for paints- Resistance to impact
5	ASTM D 4060	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
6	ASTM D 3359	Standard Test Methods for Measuring Adhesion by Tape Test
7	BS EN ISO 2813	Paints and varnishes — Determination of gloss value at 20°, 60° and 85°
8	ASTM D 3363	Standard Test Method for Film Hardness by Pencil Test1
9	ASTM D 6578	Standard Practice for Determination of Graffiti Resistance
10	ISO 2812-1	Paints and varnishes - Determination of resistance to liquids - Part 1: Immersion in liquids other than water.
11	ASTM G155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
12	ISO 8501	Preparation of steel substrates before application of Paints and related products
13	IS 13183-91	Aluminium Paint, Heat Resistant - Specification
14	IS 1573-1986	Specification for Electroplated coatings of Zinc on Iron and Steel

**Table-1:** Applicable Standards and Norms

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#### 4. REFERENCE DOCUMENTS

Sl No.	Document No.	Description
1	GR/TD/4297	Technical Specification of Carbody Structure
2	GR/TD/4313	System Description of Bogies
3	GR/TD/4781	Detailed description of Bogies
4	GR/TD/4374	System Description of Interior
5	GR/TD/4373	Industrial Design for Car Exterior

#### 5. ABBREVIATIONS

ERTS : Employer's Requirement Technical Specification

ERGS : Employer's Requirement General Specification

DMC : Driving Motor Car

TC : Trailer Car

MC : Motor Car

PDR : Preliminary Design Review


PFDR : Pre Final Design Review

FDR : Final Design Review

#### 6. DESIGN CRITERIA


The painting system on the equipment will comply with ERTS Clause 4.4.9, 5.3.6, 14.1.4 and 14.19.

ERTS Clause No.	Description	Compliance	Para no., reference of document where compliance is demonstrated	Remarks
4.4.9	Non-stainless steel surfaces below the floor of the carbody shall be primed with epoxy coating and then finish painted with two coats of an approved polyurethane paint.	Complied.	Covered in Section: 7 and 8 of this document.	

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5.3.6	Adequate corrosion protection shall be provided. A corrosion protection control programme for the bogie shall be submitted. This shall comprise of paint protection system of external surfaces. The internal areas of the frame shall be completely sealed to avoid moisture ingress after the internal surfaces are protected from corrosion by suitable corrosion resistance substance or any other alternative measure. The corrosion protection plan shall be submitted and got approved during detail design.	Complied.	Will be covered in doc no: GR/TD/4306.	
14.1.4	Welding, painting and crimping are considered as special processes. Contractor shall ensure process qualification and validation for these processes and records of the same shall be maintained for scrutiny and review by the Engineer.	Complied.		
14.19	Painting			
14.19.1	All painting processes shall be proven in railway applications, and suitable for the climate of this project, and shall be subject to review. Such processes shall include surface preparation suitable for the material, corrosion preventative priming and high durability finish. Exterior stainless steel, aluminium or their alloys shall not be painted. Bogies shall be treated with primer and an internationally accepted painting system. All steel which will be hidden, except stainless steel, shall be treated with primer and an accepted rust preventative before being concealed. The treatment of copper bearing structural steel shall be subject to acceptance by the Engineer.	Complied.	Covered in Appendix <u>A.D.E</u> of this document.	
14.19.2	Employer expects painting of the equipment/ sub-assemblies as per best International practices. Contractor shall submit the guaranteed life cycles for the paint application for different equipment and sub-assemblies for Engineer' s review during design stage.	Complied.		

**Table - 2:** Compliance Matrix for Related ERTS Clauses

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## 7. GENERAL

The paint system adopted is that of M/s.KCC, which has been used in all BEML Metro projects and has been proven in Metro Rail application.

Painting will be carried out under covered shed and protected from air, dust and moisture. All painted surfaces will match and display a uniformity of colour throughout its Service Life and shall be easily cleanable with general cleaning agents.

The paint system will meet Fire safety requirement of EN 45545 Part 1 to 7 (Category 4-A, Hazard level HL3) for both Interior and Exterior applications.

## 8. PROCEDURE OF COATING SYSTEM

The following coating systems shall be followed for the metallic substrates viz., Stainless Steel, Mild Steel, Aluminium or Glass fiber Reinforced Plastic (GFRP).

### SYSTEM 1

The system shall be applied to the metallic substrates like Mild Steel and aluminium. Please refer Appendix- A.

### SYSTEM 2

The system shall be applied to the GFRP, Other laminate and Aluminium substrates used for interior panels.. Please refer Appendix-B

### SYSTEM 3

The system will be applied to the exterior of GFRP Cab Mask & Cab Skirt. Please refer Appendix - C

### SYSTEM 4


Painting of internal surfaces of bogie frame. Please Refer Appendix - D

### SYSTEM 5

Anti-drumming compound will be applied to the under floor i.e. under the keystone plate of car body. At the interference area with bolster, center-sill, cross beam, etc., this system shall be applied to only accessible area. Mask the under frame areas like cross beam member, jack pad, centre pivot area etc by using masking tape except keystone plate area.

Please refer Appendix E - For Painting procedure & Appendix F for Insonastic AQ NF data sheet for more detailed technical description.



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**Note:** The primer and finish coating shall be applied on exposed mild steel area below floor level. The accessible parts of under floor shall be provided with anti-drumming and noise suppression paint. Unless otherwise noted, all colors of finish coat below floor level shall have a semi gloss, NCS 8500N colour, except the following:

- ◆ Application of primer only: Bolster closed area (hollow area), air bag contact plate and coupler mounting plate and coupler mounting hole.
- ◆ No application of primer and finish: Earth pad, mounting plate for centre pivot, mounting plate for anti-roll bar, plate on air bag, end face of end sill etc.
- ◆ One coat of finish paint shall be applied on bogie after complete assembly.


## 9. SPECIFICATION OF COATING THICKNESS

Case of the specified average: Mean thickness (Nominal value). This value is mandatory subjected to a tolerance.

In this case, an arithmetic thickness is to be complied with.

<b>TABLE OF PAINTING PRODUCTS AS PER THE RULE OF THE SPECIFIED AVERAGE</b>					
Products		Nominal value	Minimum value	Maximum value	Maximum point (Individual points)
System 1	Primer 1	50 µm	40 µm	80 µm	120 µm
	Finish 1	50 µm	40 µm	80 µm	120 µm
System 2	Primer (Aluminium)	30 µm	30 µm	60 µm	90 µm
	Finish (Aluminium)	50 µm	40 µm	80 µm	120 µm
	Primer (GFRP)	50 µm	40 µm	80 µm	120 µm
	Finish (GFRP)	50 µm	40 µm	80 µm	120 µm
System 3	Primer	40 µm	35 µm	70 µm	105 µm
	Finish 1	30 µm	30 µm	60 µm	90 µm
	Finish 2 (Clear Coat)	30 µm	30 µm	60 µm	90 µm
System 4	Finish 1	20 µm	15 µm	30 µm	45 µm
	Finish 2	20 µm	15 µm	30 µm	45 µm
System 5	Finish	1000 µm	800 µm	1600 µm	2500 µm

For the thickness of system 5, the real measurement point will be center of each corrugation.


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## 10. PAINTING METHOD AND COLOURS

Finished colours are defined in the Natural Colour System (NCS) and RAL shades.

The following are the colour shades painted in different regions of MRS1 cars.

Description		Substrate	Painting System	Finish Color	Gloss level
<b>1. Bogie</b>					
a) Bogie frame		Steel	1	NCS 8500N	Semi Gloss
b) Internal surfaces of bogie frame		Steel	4	Aluminium	Semi Gloss
<b>2. Under frame</b>					
(a) Bolster Assy, Sill Assy. Center, pad Jacking, Anti Climber & Stiffener		Steel	1	NCS 8500N	Semi Gloss
(b) Beneath key stone plate (Anti-drumming compound)		SUS	5	-	-
(c) Underframe except (a) & (b)		SUS	No painting	Metal colour	-
<b>3. Interior (Saloon)</b>					
- Interior side panels		GFRP	2	RAL9010	Semi Gloss
- End Cubicle panels		GFRP	2	RAL9010	Semi Gloss
- Ceiling end panels		GFRP	2	RAL9010	Semi Gloss
- Ceiling panels		Al honeycomb	2	RAL9010	Semi Gloss
- Return air grille for saloon		Al	2	RAL9010	Semi Gloss
- Duct panels		Al	2	RAL9010	Semi Gloss
- Air diffuser	Line-2- Yellow	Al	2	RAL1021	Semi Gloss
	Line-7- Red	Al	2	RAL3028	Semi Gloss
Bulkhead panel (Draught screen)		Al	2	RAL9010	Semi Gloss
Infill strip panels		GFRP	2	RAL9010	Semi Gloss
- Door coving & Ceiling coving panels		GFRP	2	RAL9010	Semi Gloss
<b>4. Interior (Driver's Cab)</b>					
- Front panels		GFRP	2	RAL9010	Semi Gloss
-Front upper panels		GFRP	2	RAL9010	Semi Gloss
- Side panels		GFRP	2	RAL9010	Semi Gloss
- Partition wall panel		Al honeycomb	2	RAL9010	Semi Gloss
- Ceiling panel		Al honeycomb	2	RAL9010	Semi Gloss
- Inspection covers (Cab area) in Non-UTO & UTO		GFRP	2	RAL9010	Semi Gloss
- Driver's desk (except operation panels, equipment)		GFRP	2	RAL9010	Semi Gloss
- Auxiliary desk(except equipment)		GFRP	2	RAL9010	Semi Gloss
- Driver's seat frame		Steel	1	Gray NCS 5500N	Semi Gloss
- Partition door		Al honeycomb	2	RAL9016	Semi Gloss
<b>5. Electric Equipment</b>					
<b>Pantograph</b>					
Base frame		Steel	1	RAL 3020	-
Upper frame		Steel	1	RAL 3020	-
Lower frame		Steel	1	RAL 3020	-

 NEW FRONTIERS, NEW DREAMS	Painting Specification For MRS1 Project	DRCA No.	MRS1/IE.10.00/M/B008/A2		
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Description		Substrate	Painting System	Finish Color	Gloss level
Propulsion					
Traction Motor		Steel	1	Munsell 1.5 (Black)	-
Main transformer		Steel	1	RAL 9005 (Black)	-
Master controller		steel	1	RAL 9005 (Black)	-
Lighting					
- Passenger saloon light. DC		Al	2	RAL 9010	Semi Gloss
- Gangway light		Al	2	RAL 9010	Semi Gloss
- Cab main light		Al	2	RAL 9010	Semi Gloss
- Driving Console light		PC	2	RAL 9010	Semi Gloss
- Flasher light / Flood light		Al	2	RAL9005	Matt
- Head & Tail light		GRP/PUR cast	2	RAL9005 (Tentative, TBU)	TBD
Operating Panels					
Operating Panel-1		Al	2	RAL 9005 (Black)	Semi Gloss
Operating Panel-2		Al	2	RAL 9005 (Black)	Semi Gloss
Operating Panel-3		Al	2	RAL 9005 (Black)	Semi Gloss
Operating Panel-4		Al	2	RAL 9005 (Black)	Semi Gloss
Operating Panel-5		Al	2	RAL 9005 (Black)	Semi Gloss
Electrical Panels					
EDB, DMC car		SPCC	1	RAL9010	Semi Gloss
EDB, TC car		SPCC	1	RAL9010	Semi Gloss
EDB, MC car		SPCC	1	RAL9010	Semi Gloss
PAPIS & CCTV System					
PIS control unit		Al	1	Natural anodizing of Al.	-
Saloon control unit		Al	1	Natural anodizing of Al.	-
Main operational panel		Al	1	RAL9010	Semi Gloss 40%-60%
Cab loudspeaker		Steel Q235	1	RAL9005	-
Passenger emergency control unit	Steel (Front panel)	1	RAL9010	Semi Gloss 40%-60%	
	Steel (Back box)	1	RAL9005	-	
Saloon loudspeaker		Steel	1	RAL9005	-
Dynamic route map		Steel	1	RAL9005	-
36.8 inches Liquid Crystal Display		Steel	1	RAL9005	-
Cab switch		Steel	1	RAL9005	-
Saloon switch		Steel	1	RAL9005	-
Front display unit		Al	1	RAL9005	-
Train number indicator		Al	1	RAL9005	-
Side display unit		Al	1	RAL9005	-
Saloon camera	Al (body)	1	RAL9010	Semi Gloss 40%-60%	
	Steel( Bracket)				
ODD camera	SS (Enclosure)	1	RAL90005	Semi Gloss 40%-60%	
	Al (Body)	1	RAL90005		
	PC (Dome Cover)		No painting		
Track view camera	Al (Body)	1	RAL9005	Semi Gloss 40%-60%	
	PC(Dome Cover)		No painting		

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Description		Substrate	Painting System	Finish Color	Gloss level
Front camera		Al (Body)	1	RAL9005	Semi Gloss 40%-60%
		PC(Dome Cover)		No painting	
Detrainment camera		Al (Body)	1	RAL9010	Semi Gloss 40%-60%
		PC(Dome Cover)		No painting	
Pantograph monitoring camera		Al (Body)	1	Pantone 426C	High gloss
		Al (Bracket)	1	RAL9005	Semi Gloss
Exterior camera		Al (Body)	1	Pantone 426C	High gloss
		Al (Bracket)	1	RAL9005	Semi Gloss
Network Video Recorder		Al	1	RAL9005	-
External loudspeakers		SS (Font plate)	1	2J Finish	-
		Steel (Back cover )	1	RAL9005	-
Cab-Cab Jumper Receptacle		Al	1	RAL9005	-
Cab-Cab Jumper connector		Al	1	RAL9005	-
6. Exterior					
-Cab Mask	Blue Zone	GFRP	3	PANTONE 287C	High Gloss
	Black zone	GFRP	3	RAL9005	High Gloss
- Cab Skirt		GFRP	3	PANTONE 287C	High Gloss
- Passenger Door Skin	Exterior	SUS	-	No Painting	-
	Interior	SUS	-	No Painting	-
* Note: SUS – Stainless Steel Al – Aluminum High Gloss 80 ±10 Semi Gloss 50±10					


## 11. TOUCH UP & REPAIR PROCEDURES

The damage area and the surrounding area should be cleaned and degreased with thinner or acetone.

Any loose, flaking coating of finish coat should be abraded with either 120-240 grade sanding paper using mechanical or manual methods depending on the extent and degree of damage. After the abrading operation, any residual debris and dust must then be removed using vacuum brush. The abraded areas should then be further degreased with acetone.

If the substrate is exposed, apply primer and finish coat as per coating systems. If the substrate is not exposed and primer is intact after abrading, apply only finish coat as per coating systems.

When the repair area is very less, touch up with brush for repair. however when the area is large, spray-coating to be adopted.

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### 11.1. GRAFFITI REMOVAL

The graffiti made of different markers on painted surface shall be removed as per ASTM D 6578.


## 12. PERFORMANCE FOR PAINTS

The paints used will be tested and satisfied for limited fire hazard performance according to the EN 45545 Part 1 to 7 (Category 4-A, Hazard level HL3).

### 12.1. FIRE PERFORMANCE

The paints will be tested for fire performance as follows.

Requirement set (used for)	Test method reference	Parameter and unit	Maximum or Minimum	HL3
R1	T02 (ISO 5658-2)	CFE, (kW/m <sup>2</sup> )	Minimum	20
	T03.01 ISO 5660-1: 50kW/m <sup>2</sup>	MARHE (kW/m <sup>2</sup> )	Maximum	60
	T10.01 EN ISO 5659- 2: 50kW/m <sup>2</sup>	T10.01 EN ISO 5659-2: 50kW/m <sup>2</sup>	Maximum	150
	T10.02 EN ISO 5659-2: 50kW/m <sup>2</sup>	VOF <sub>4</sub> min	Maximum	300
	T11.01 EN ISO 5659-2: 50kW/m <sup>2</sup>	CIT <sub>G</sub> dimensionless	Maximum	0.75
<b>Fire Propagation</b>				
R7 (EX3,EX8)	T02 ISO 5658-2 Lateral Flame Spread	CFE kWm <sup>-2</sup>	Minimum	20
	T03.01 ISO 5660-1: 50 kWm <sup>-2</sup> Heat Content Reaction to fire tests - Heat Release, Smoke Production and Mass loss rate - Part -1 : Heat Release Rate (Cone Calorimeter method)	MARHE kWm <sup>-2</sup>	Maximum	60
	T10.04 EN ISO 5659-2: 50 kWm <sup>-2</sup> Smoke Density	D <sub>s</sub> max dimensionless	Maximum	300
	T11.01 EN ISO 5659-2: 50 kWm <sup>-2</sup> Toxicity	CIT <sub>G</sub> dimensionless	Maximum	1.5
R9(EX9,EX10)	T03.02 ISO 5660-1: 25 kWm-2 Heat Content	MARHE kWm <sup>-2</sup>	Maximum	60

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	Reaction to fire tests - Heat Release, Smoke Production and Mass loss rate - Part -1 : Heat Release Rate (Cone Calorimeter method)				
	T10.03 EN ISO 5659-2: 25 kWm <sup>-2</sup> Smoke Density	D <sub>s</sub> max dimensionless	Maximum	300	
	T11.02 EN ISO 5659-2: 25 kWm <sup>-2</sup> Toxicity	CIT <sub>G</sub> dimensionless	Maximum	1.5	
R17	T02 (ISO 5658-2)	CFE . (kW/m <sup>2</sup> )	Minimum	13	
	T03.01 ISO 5660-1: 50kW/m <sup>2</sup>	MARHE (kW/m <sup>2</sup> )	Maximum	60	
	T10.04 EN ISO 5659-2: 50kW/m <sup>2</sup>	D <sub>s</sub> max dimensionless	Maximum	300	
	T11.01 EN ISO 5659-2: 50kW/m <sup>2</sup>	CIT <sub>G</sub> dimensionless	Maximum	1.5	
<b>Requirement set (used for)"</b>	<b>Test method reference</b>	<b>Parameter and unit</b>	<b>Maximum or Minimum</b>	<b>HL2</b>	
R10 (IN1C)	T04 EN ISO 9239-1 Horizontal Flame spread	CFE kWm <sup>-2</sup>	Minimum	6	
	T03.02 ISO 5660-1: 25 kWm-2 Heat Content Reaction to fire tests - Heat Release, Smoke Production and Mass loss rate - Part -1 : Heat Release Rate (Cone Calorimeter method)	MARHE kWm <sup>-2</sup>	-	-	
	T10.03 EN ISO 5659-2: 25 kWm-2 Smoke Density	D <sub>s</sub> max dimensionless	Maximum	300	
	T11.02 EN ISO 5659-2: 25 kWm-2 Toxicity	CIT <sub>G</sub> dimensionless	Maximum	0.9	

### 13. APPENDICES


Appendix A : System Recommendation – Protection of metallic substrates

Appendix B : System Recommendation – Protection of phenolic GFRP & Aluminium Substrates used for Interiors

Appendix C: System Recommendation – Protection of Exteriors GFRP- Cab Mask, & Cab Skirt

Appendix D: Painting procedure for Bogie frame internal surfaces

Appendix E: Painting procedure for anti drumming paint.

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Appendix F: INSONASTIC AQ NF Data Sheet

## 14. ATTACHMENTS

Attachment - 1: Inspection Check sheet for Shot blasting, primer & finish painting of Bogie assembly.

Attachment - 2: Inspection Check sheet for painting bolster & center sill.

Attachment - 3: Inspection Check sheet for Anti drumming Paint of Under frame.

Attachment - 4: NCS Color Code Sheet.

**APPENDIX A**

**SYSTEM RECOMMENDATION**

**FOR**

**PROTECTION OF METALLIC SUBSTRATES USED FOR  
VARIOUS COMPONENTS OF MRS1 METRO CARS**

**Coating System  
EP 1119 PRIMER/ UT 5119 FINISH COAT**



# **C O N T E N T S**

## **1. INTRODUCTION**

## **2. SYSTEM RECOMMENDATIONS**

### 2.1. Proposed System

### 2.2. Surface Preparation

#### 2.2.1. Mild Steel

#### 2.2.2. Stainless Steel

#### 2.2.3. Aluminium

### 2.3. Application of **EP 1119 Primer**

### 2.4. Application of **UT5119 Finish Coat**

## **1. INTRODUCTION**

The following system recommendations are based on **KCC paints to grade EP 1119 primer & UT 5119 finish paint** – Both Two Pack Epoxy and polyurethane systems respectively.

This product has been developed as either a two coat or part of a multi-coat system for the long term maintenance and finishing of Steel and Aluminium.

## **2. SYSTEM RECOMMENDATION**

### **2.1. Proposed System**

Process	Coats	Product name		Mixing Ratio (vol.)	D.F.T (µm)	Recoating Interval (hr)	Thinner	Drying time
Surface Preparation	Remove oil and grease from the surface to be painted and grit blast to SIS SA 2½							
Primer	1 <sup>st</sup>	Epoxy primer	EP1119	3:1	30 ± 10	6 hrs	024	6 hrs
Primer	2 <sup>nd</sup>	Epoxy primer	EP1119	3:1	30 ± 10	6 hrs	024	6 hrs
Top coat	3 <sup>rd</sup>	Poly Urethane	UT5119	4:1	30 ± 10	Min. 10 hrs	037U	8 hrs
Top coat	4 <sup>th</sup>	Poly Urethane	UT5119	4:1	30 ± 10	Min. 10 hrs	037U	8 hrs

### **2.2. Surface Preparation**

#### **2.2.1. Substrate - Mild Steel**

All surfaces shall be generally degreased using Cleaning Solvent.

The degreased surfaces shall be abrasive blasted to a minimum SA 2½ Standard for Steel (Mean Profile 45 microns). The chosen abrasive may be expendable grit or chilled iron grit. Comparative samples of SA 2½ shall be kept at BEML for verifying the surface preparation.

Note: Mild steel surfaces shall be protected with primer within 4 hours of abrasive blasting.

### **2.2.2. Substrate-Stainless Steel (Except Underframe for which System-3 is applicable)**

All surfaces shall be generally degreased using Cleaning Solvent.

The degreased surfaces shall be lightly abrasive blasted with conditioned cut wire stainless steel shots to grade SCW-23 of SAE J441 to achieve a uniformly etched surface roughness of 20-25 microns. Comparative samples of abrasive blasted surface shall be kept at BEML for verifying the surface preparation.

All dirt and resultant debris of abrading shall be thoroughly removed prior to the application of EP 1119 Primer.

### **2.3. Application of Primer (Two coats of $30 \pm 10 \mu\text{m}$ each)**

All surfaces to be primed must be completely clean of dust, dirt and grease and thoroughly dry. Room conditions should be checked before application of primer. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the substrate.

**EP 1119** Epoxy Primer is a two component high performance epoxy coating, supplied as a base component EP 1119 (A) and an activator component EP1119 (B).

It provides excellent anti-corrosion and adhesion to steel, aluminium and other materials.

Before application, the following procedures must be observed.

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five minutes to produce a homogeneous mixture. The mixing ratio of base EP1119(A) : activator EP1119(B) is 3:1 by volume. The base and hardener have to be mixed thoroughly half an hour prior to application.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of 024 Thinner (30-60%). The thinned material shall then be thoroughly stirred before application.

The pot life is 10 hours at 20 °C.

**NOTE:** If only part quantities of the base and activator are to be used, care must be taken to maintain the volume mixing ratio of 3:1 respectively as well as total compliance with the above mixing procedures.

**EP1119 Primer** shall be applied by spray to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun / gravity feed spray gun,  
nozzle size 1– 1.5 mm)

Spray viscosity: 24-28 sec. (Viscosity of prepared primer paint to be measured by Ford Cup 4).

Allow for drying	Temp.	Touch dry	Hard dry
	10°C	1 h	18 h
	20°C	½ h	6 h
	30°C	½ h	4 h

Touch dry shall be achieved in dust free environment.

The dry film thickness for each coat shall be  $30 \pm 10 \mu\text{m}$ . The DFT shall be measured using a paint coating thickness Gauge.

#### **2.4. Application of Finish Coat (Two coats of $30 \pm 10 \mu\text{m}$ each)**

**UT 5119 Finish Coat** is a two component, Polyurethane resin based finish paint with excellent color and gloss retention, workability and durability. The coating is supplied as a two pack system a base component UT5119 (A) and an activator component UT5119 (B).

Before the application of the **Finish Coat**, it is essential to ensure that the primed surface is clean and completely free of any contamination. Room conditions should be checked before application of finish paint. The humidity of the room shall be  $<85\%$ . If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the substrate.

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five minutes to produce a homogeneous mixture. The mixing ratio of base UT5119(A) : activator UT5119(B) is 4:1 by volume.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of 037U **Thinner** (30-60%). The thinned material shall then be thoroughly stirred before application.

The pot life of the mixture is 8 hours at  $20^{\circ}\text{C}$

**UT5119 Finish coat** shall be applied by spray to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun/ gravity feed spray gun,  
nozzle size 1– 1.5 mm)

Spray viscosity: 20 – 24 sec. (Ford #4/ $20^{\circ}\text{C}$ )

The dry film thickness shall be  $30 \pm 10 \mu\text{m}$  for each coat. The DFT shall be measured using a paint coating thickness Gauge. The gloss level shall be measured using a Gloss meter.

**APPENDIX B**

**SYSTEM RECOMMENDATION  
FOR  
PROTECTION OF PHENOLIC GFRP AND ALUMINIUM  
SUBSTRATES USED FOR INTERIORS OF  
MRS1 METRO CARS**

**Coating System**  
**EP1119 PRIMER / UT5119 FINISH COAT**

# **C O N T E N T S**

## **1. INTRODUCTION**

## **2. SYSTEM RECOMMENDATIONS**

2.1. Proposed Systems

2.2. Surface Preparation

2.2.1. Phenolic GFRP

2.2.2. Aluminium

2.3. Application of **EP 1119 Primer**

2.4. Application of **UT5119 Finish Coat**

## **3. PERFORMANCE DATA**

3.1 Mechanical Property

3.2 Fire Performance

## **1. INTRODUCTION**

This painting System is applicable for Interior applications on Phenolic GFRP substrates like side wall, ceiling coving panel, Door coving panel, Infill strips, gangway cubicles, ceiling end panel & cab Interior panels and on aluminium substrates like Ceiling panel, diffuser and bulk head panels.

The following system recommendations are based on KCC paints to grade EP1119 primer & UT5119 finish paint – Both Two Pack Epoxy and polyurethane systems respectively.

Epoxy fire retardant primer EP1119 and Polyurethane top coat UT5119 finish colour system provide high performance and long term coating protection.

## **2. SYSTEM RECOMMENDATIONS**

### **2.1. Proposed Systems**

The system proposed for interiors is as follows.

Process	Coats	Paint & coating method	Product name	Mixing Ratio (vol)	D.F.T (µm)	Recoating interval (at 20°C)	Thinner	Remarks
Putty	-	Polyester putty	PC2900	100:1~3 (by wt%)		4 hrs	Acetone	
Primer	1 <sup>st</sup>	Epoxy primer	EP1119	3:1	30 ± 10	Min - 6 hrs Max - 7 days	024	60 ± 20 (GFRP) 45 ± 15 (AL)
	2 <sup>nd</sup>	Epoxy primer	EP1119	3:1	30 ± 10	Min - 6 hrs Max - 7 days	024	
Top coat	3 <sup>rd</sup>	Polyurethane Top coat	UT5119	4:1	30 ± 10	Min. – 8 hrs Max. - 7 days	037U	
	4 <sup>th</sup>	Polyurethane Top coat	UT5119	4:1	30 ± 10	Min. – 8 hrs Max. - 7 days	037U	

### **2.2. Surface Preparation**

#### **2.2.1. Substrate - Phenolic GFRP**

##### **2.2.1.1 Visual Examination**

Initially all GFRP panels shall be visually examined for undulations, dry resins residues, cut marks, etc., If the undulations require more than 5% putty application, the panel shall be rejected.

##### **2.2.1.2. Putty application at undulations and pin holes**

Generally, Phenolic GFRP surfaces will have some surface pinhole/defects. To cover these pin holes and to hide the fibre grain structure of FRP panel surface and smoothen it, a very thin layer of putty is to be applied before and after primer application. These layers of putty have to be so thin that during sanding, precaution is to be taken not to excessively sand, otherwise fibre

layer may get damaged. Two or more layers may be required, as thicker putty will shrink after drying.

The visually examined surfaces shall be thoroughly cleaned with pressurised air, cloth and acetone to remove any moisture, dust, oil, grease and other contaminants.

The degreased surface areas shall then be abraded with P120 sand paper for proper bonding of putty with surface. All dirt and resultant debris shall then be thoroughly removed.

PC 2900 Polyester putty shall be used to cover undulations and pin-holes and to smoothen the surface.

Before application of putty, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

PC 2900 Polyester putty is a two component fast curing unsaturated polyester filler. It is supplied as a Base component and an Activator component.

Dirt, dust or oil, if any, shall be completely removed before application of putty.

The proportions of Base and Activator (100:1~3% by wt) of the putty shall be transferred to a suitable mixing board and thoroughly mixed together to produce a homogeneous, streak free material.

After thorough mixing, the putty shall be applied into the surface defects using a stainless steel spatula and smoothed out.

The pot life of the putty is only 10 minutes. Hence, the mixture has to be made in small quantities and immediately applied.

Allow for drying

<u>Temp.</u>	<u>Drying time</u>
Room temp.	4 h
40-60 °C	20-30 minutes

Next coating interval should not exceed 30 days maximum.

After drying, visually examine the panel surface for undulations and surface inaccuracies. If defects are found, another layer of putty has to be applied following the procedure outlined above. Otherwise proceed for 1<sup>st</sup> layer of putty application on entire surface.

### **2.2.1.3. 1<sup>st</sup> layer Putty application on entire surface of the panel**

The panels shall be mechanically flattened/sanded using 220/320 grade paper to achieve a smooth and even surface.

All debris and dust from the flattening/sanding operation shall be removed by the use of compressed air.



A very thin layer of PC2900 putty shall be applied on the entire surface of the panel to smoothen the surface.

Before application of putty, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

PC 2900 Polyester putty is a two component fast curing unsaturated polyester filler. It is supplied as a Base component and an Activator component.

The proportions of Base and Activator (100:1~3% by wt) of the putty shall be transferred to a suitable mixing board and thoroughly mixed together to produce a homogeneous, streak free material.

After thorough mixing, the putty shall be applied into the surface defects using a stainless steel spatula and smoothed out.

The pot life of the putty is only 10 minutes. Hence, the mixture has to be made in small quantities and immediately applied.

Allow for drying

<u>Temp.</u>	<u>Drying time</u>
Room temp.	4 h
40-60 °C	20-30 minutes

### **2.2.2. Substrate - Aluminium**

All surface areas shall be thoroughly degreased and then lightly flash blasted or mechanically abraded with Scotch brite pads to achieve a uniformly etched surface.

All dirt and resultant debris must be thoroughly removed and surfaces which have been contaminated during abrading stage shall be degreased again using Thinner/Cleaning Solvent prior to application of the primer.

## **2.3. Application of Primer (In 2 layers of 30±10 µm each)**

### **2.3.1. Application of First coat of Primer**

After surface preparation as at 2.2 above, the panels shall be mechanically flattened/sanded using 220/320 grade paper to achieve a smooth and even surface.

All debris and dust from the flatting/sanding operation shall be removed by the use of compressed air.

Surfaces shall now be degreased, using thinner/ solvent, to remove any surface contamination resulting from the sanding operation.

Surfaces shall finally be solvent wiped using clean rags. Clean and dry surface shall be ensured prior to application of primer.

Before application of primer, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

**EP 1119** Epoxy Primer is a two component high performance epoxy coating, supplied as a base component EP 1119 (A) and an activator component EP1119 (B).

It provides excellent anti-corrosion and adhesion to steel, aluminium and other materials.

Before application, the following procedures must be observed.

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five minutes to produce a homogeneous mixture. The mixing ratio of base EP1119 (A): activator EP1119 (B) is 3:1 by volume. The base and hardener have to be mixed thoroughly half an hour prior to application.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of 024 Thinner (30-60%). The thinned material shall then be thoroughly stirred before application. The pot life is 6 hours at 20 °C.

**NOTE:** If only part quantities of the base and activator are to be used, care must be taken to maintain the volume mixing ratio of 3:1 respectively as well as total compliance with the above mixing procedures.

**EP1119 Primer** shall be applied by spray to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun / gravity feed spray gun,  
nozzle size 1 – 1.5 mm)

Spray viscosity: 24-28 sec. (Viscosity of prepared primer paint to be measured by Ford Cup 4)

Allow for drying

<u>Temp.</u>	<u>Touch dry</u>	<u>Hard dry</u>
10°C	1 h	18 h
20°C	½ h	6 h
30°C	½ h	4 h
60-70 °C		45-60 minutes

Touch dry shall be achieved in dust free environment.

Sandering of FRP panels for next layer of PU paint should not be done before hard dry.

Next coating interval is 7 days maximum

The dry film thickness shall be  $30 \pm 10 \mu\text{m}$ . The DFT shall be measured using a paint coating thickness Gauge for aluminium substrate and for the GFRP a metallic painted panel shall be prepared daily and it's DFT shall be checked and this shall be kept as reference to verify the GFRP panel DFT which is painted under similar conditions.

### **2.3.2: 2<sup>nd</sup> layer Putty application on defective portions of the FRP panel**

The primed FRP panels shall be visually inspected. Check the surface for cracks, undulations, peel off, pin holes etc.

If defects are found, apply 2<sup>nd</sup> layer of putty over the defective portions following the procedure at 2.2.1.2

If no defects found, apply 2<sup>nd</sup> coat of epoxy primer.

### **2.3.3 : Putty application on Aluminium panels**

A thin layer of putty shall be applied at corners and edges of Aluminium panels to ensure evenness at the interface regions of the panels.

### **2.3.4: 2<sup>nd</sup> coat Epoxy primer application on entire surface**

Apply 2<sup>nd</sup> coat of primer following the procedure at 2.3.1.

After primer application, visually inspect the FRP surface and check for cracks, undulations, peel off, pin holes etc., If defects are found, reject the item. Otherwise PU finish painting shall be done.

If a defect is found after applying primer and the piece is to be used, all the primer layer should be removed first and process shall be re-started from the putty application stage.

### **2.4. Finish PU Coat Application ( in 2 layers of 30±10µm each)**

After primer application as at 2.3 above, the panels shall be mechanically flattened/sanded using 400 grade sand paper to achieve a smooth and even surface. Curve profiles shall be manually sanded.

All debris and dust from the flatting/sanding operation shall be removed by the use of compressed air.

Surfaces shall now be degreased, using thinner/ solvent, to remove any surface contamination resulting from the sanding operation.

Surfaces shall finally be solvent wiped using clean rags .Clean and dry surface shall be ensured prior to application of Finish paint.

Before application of finish paint, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is ≥ 85%, then oven heat or hot air blow the panel.

**UT 5119 Finish Coat** is a two component, Polyurethane resin based finish paint with excellent color and gloss retention, workability and durability. The coating is supplied as a two pack system a base component UT5119 (A) and an activator component UT5119 (B).

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five

minutes to produce a homogeneous mixture. The mixing ratio of base UT5119 (A): activator UT5119 (B) is 4:1 by volume.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of **037U Thinner** (30-60%). The thinned material shall then be thoroughly stirred before application

**UT5119 Finish coat** shall be applied by Diaphragm pump spray gun / gravity feed spray gun to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun / gravity feed spray gun,  
nozzle size 1– 1.5 mm)

Spray viscosity : 20-24 sec.(Viscosity of prepared finish paint to be measured by Ford Cup 4)

Allow for drying

Temp.	Touch dry	Hard dry
10°C	½ h	6 h
60°C	-	1.5 h
80°C	-	1 h

In natural drying, touch dry shall be achieved in dust free environment. Forced drying can be done in baking oven

Sanding of FRP panels for next layer of PU paint should not be done before hard dry.

Next coating interval is 7 days maximum.

The dry film thickness shall be  $30 \pm 10 \mu\text{m}$ . The DFT shall be measured using a paint coating thickness Gauge for aluminium substrate and for the GFRP a metallic painted panel shall be prepared daily and it's DFT shall be checked and this shall be kept as reference to verify the GFRP panel DFT which is painted under similar conditions

The 1<sup>st</sup> coat finish painted FRP panels shall be visually inspected. Check the surface for cracks, undulations, peel off, pin holes etc. If defects are found, panel shall be rejected. If no defects found, apply 2<sup>nd</sup> coat of finish paint.

If a defect is found after applying PU paint, and the panel is to be used, the entire paint and primer layer should be removed first and process shall be re-started from the putty application stage.

**Visual Inspection of painted panels** : The panels shall be inspected under illumination of 800 lux minimum. The panels shall be free from defects like orange peel, pin holes, finger prints, air bubbles, shade difference, roughness, undulation, paint flow, scratch marks, etc., If defects are found, panel shall be rejected. The gloss level shall be measured using a Gloss meter

### **3. PERFORMANCE DATA**

#### **3.1 Mechanical Property**

<b>Property</b>	<b>Test result</b>	<b>Standard</b>
Scratch Resistance	No failure	BS 3900 Part E2, BS EN ISO 1518:2001
Chip Resistance	Class 2	BS AU 148 Part 15
Impact test (Falling ball)	No failure	BS 3900 Part E7
Abrasion resistance	Max 60 mg	ASTM D4060 CS10 wheel 500 cycles – 1000 gm load
Adhesion	5B	ASTM D 3359 (Method B)
Gloss Level	40-60(semi-gloss)	BS EN ISO 2813:2000/ BS 3900
Film Hardness	H	ASTM D 3363
Anti-graffiti	Level 5	ASTM D 6578
Acid & Alkali Resistance	No defect	ISO 2812-1
Accelerated Weathering Test ( QUV x 500 hrs )	Gloss (60°)>90% $\Delta E < 2$	ASTM G155

#### **3.2 Fire Performance**

<b>Requirement set</b>	<b>Property</b>	<b>Test method reference</b>	<b>Parameter unit and</b>	<b>Criteria For HL3</b>
R1	Lateral flame spread	T02 ISO 5658-2	CFE (kW/m <sup>2</sup> )	Minimum 20
	Heat release rate	T03.01 ISO 56601-:50 kWm <sup>-2</sup>	MARHE (kW/m <sup>2</sup> )	Maximum 60
	Smoke generation	T10.01 EN ISO 5659-2: 50kWm <sup>-2</sup>	D <sub>s</sub> (4) (dimensionless)	Maximum 150
	Smoke generation	T10.02 EN ISO 5659-2: 50kWm <sup>-2</sup>	VOF <sub>4</sub> min	Maximum 300
	Toxicity	T11.01 EN ISO 5659-2: 50kWm <sup>-2</sup>	CIT <sub>G</sub> dimensionless	Maximum 0.75

**APPENDIX C**

**SYSTEM RECOMMENDATION**

**FOR**

**PROTECTION OF EXTERIORS OF MRS1 METRO CARS-  
CAB MASK & CAB SKIRT**

**Coating System**  
**EP 1119 PRIMER/ UT5119 FINISH COAT / POLYURETHANE  
CLEAR COAT**

## **C O N T E N T S**

### **1. INTRODUCTION**

### **2. SYSTEM RECOMMENDATION**

#### 2.1 Proposed System

#### 2.2 Surface Preparation

##### 2.2.1 Phenolic GFRP

##### 2.2.2 Aluminium

#### 2.3 Application of EP 1119 Primer

#### 2.4 Application of Finish Coat UT5119

#### 2.5 Application of Polyurethane Clear Finish UT5119

### **3. PERFORMANCE DATA**

#### 3.1 Mechanical Property

#### 3.2 Fire Performance

## **1. INTRODUCTION**

This System recommendation has been prepared to provide a glossy finish to selected areas of Metro car exteriors such as Cab mask and cab skirt.

The system consists of EP1119 primer, a two component solvent based epoxy primer, which provides protection to GFRP substrates. The final coat is a Polyurethane Clear Finish, a two component solvent based polyurethane coating, used for the exterior livery finishing. The intermediate coat used is a Polyurethane finish coat UT5119 of Dark Blue (pantone287C).

## **2. SYSTEM RECOMMENDATIONS**

### **2.1. Proposed Systems**

The system proposed for exteriors is as follows.

Process		Product name		Mixing Ratio (vol)	D.F.T (µm)	Recoating interval (at 20°C)	Thinner
Putty		Polyester putty	PC2900	100:1~3 (by wt%)		4 hrs	Acetone
Primer	1 <sup>st</sup>	Epoxy primer	EP1119	3:1	25 ± 10	Min - 6 hrs Max - 7 days	024
	2 <sup>nd</sup>	Epoxy primer	EP1119	3:1	25 ± 10	Min - 6 hrs Max - 7 days	024
Top Coat	3 <sup>rd</sup>	Polyurethane Top coat	UT5119	4:1	45 ± 15	Min. - 8 hrs Max. - 7 days	037U
	4 <sup>th</sup>	Polyurethane Clear lacquer	UT5119-clear-coat	4:1	45 ± 15	Min. - 8 hrs Max. - 7 days	037U

### **2.2. Surface Preparation**

#### **2.2.1. Substrate - Phenolic GFRP**

##### **2.2.1.1 Visual Examination**

Initially all GFRP panels shall be visually examined for undulations, dry resins residues, cut marks, etc., If the undulations require more than 5% putty application, the panel shall be rejected.

##### **2.2.1.2. Putty application at undulations and pin holes**

Generally, Phenolic GFRP surfaces will have some surface pin hole/defects. To cover these pin holes and to hide the fibre grain structure of FRP panel surface and smoothen it, a very thin layer of putty is to be applied before and after primer application. These layers of putty have to be so thin that during sanding, precaution is to be taken not to excessively sand, otherwise fibre layer may get damaged. Two or more layers may be required, as thicker putty will shrink after drying.

The visually examined surfaces shall be thoroughly cleaned with pressurised air, cloth and acetone to remove any moisture, dust, oil, grease and other contaminants.



The degreased surface areas shall then be abraded with P120 sand paper for proper bonding of putty with surface. All dirt and resultant debris shall then be thoroughly removed.

PC 2900 Polyester putty shall be used to cover undulations and pin-holes and to smoothen the surface.

Before application of putty, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

PC 2900 Polyester putty is a two component fast curing unsaturated polyester filler. It is supplied as a Base component and an Activator component.

Dirt, dust or oil, if any, shall be completely removed before application of putty.

The proportions of Base and Activator (100:1~3% by wt) of the putty shall be transferred to a suitable mixing board and thoroughly mixed together to produce a homogeneous, streak free material.

After thorough mixing, the putty shall be applied into the surface defects using a stainless steel spatula and smoothed out.

The pot life of the putty is only 10 minutes. Hence, the mixture has to be made in small quantities and immediately applied.

Allow for drying

<u>Temp.</u>	<u>Drying time</u>
Room temp.	4 h
40-60 °C	20-30 minutes

Next coating interval should not exceed 30 days maximum.

After drying, visually examine the panel surface for undulations and surface inaccuracies. If defects are found, another layer of putty has to be applied following the procedure outlined above. Otherwise proceed for 1<sup>st</sup> layer of putty application on entire surface.

#### **2.2.1.3. 1<sup>st</sup> layer Putty application on entire surface of the panel**

The panels shall be mechanically flattened/sanded using 220/320 grade paper to achieve a smooth and even surface.

All debris and dust from the flatting/sanding operation shall be removed by the use of compressed air.

A very thin layer of PC2900 putty shall be applied on the entire surface of the panel to smoothen the surface.

Before application of putty, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

PC 2900 Polyester putty is a two component fast curing unsaturated polyester filler. It is supplied as a Base component and an Activator component.

Dirt, dust or oil, if any, shall be completely removed before application of putty.

The proportions of Base and Activator (100:1~3% by wt) of the putty shall be transferred to a suitable mixing board and thoroughly mixed together to produce a homogeneous, streak free material.

After thorough mixing, the putty shall be applied into the surface defects using a stainless steel spatula and smoothed out.

The pot life of the putty is only 10 minutes. Hence, the mixture has to be made in small quantities and immediately applied.

Allow for drying

<u>Temp.</u>	<u>Drying time</u>
Room temp.	4 h
40-60 °C	20-30 minutes

### **2.2.2. Substrate - Aluminium**

All surface areas shall be thoroughly degreased and then lightly flash blasted or mechanically abraded with Scotch brite pads to achieve a uniformly etched surface.

All dirt and resultant debris must be thoroughly removed and surfaces which have been contaminated during abrading stage shall be degreased again using Thinner/Cleaning Solvent prior to application of the primer.

## **2.3. Application of Primer (In 2 layers of 30±10 µm each)**

### **2.3.2. Application of First coat of Primer**

After surface preparation as at 2.2 above, the panels shall be mechanically flattened/sanded using 220/320 grade paper to achieve a smooth and even surface.

All debris and dust from the flattening/sanding operation shall be removed by the use of compressed air.

Surfaces shall now be degreased, using thinner/ solvent, to remove any surface contamination resulting from the sanding operation.

Surfaces shall finally be solvent wiped using clean rags. Clean and dry surface shall be ensured prior to application of primer.

Before application of primer, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

**EP 1119** Epoxy Primer is a two component high performance epoxy coating, supplied as a base component EP 1119 (A) and an activator component EP1119 (B).

It provides excellent anti-corrosion and adhesion to steel, aluminium and other materials.

Before application, the following procedures must be observed.

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five minutes to produce a homogeneous mixture. The mixing ratio of base EP1119 (A): activator EP1119 (B) is 3:1 by volume. The base and hardener have to be mixed thoroughly half an hour prior to application.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of 024 Thinner (30-60%). The thinned material shall then be thoroughly stirred before application. The pot life is 6 hours at 20 °C.

**NOTE:** If only part quantities of the base and activator are to be used, care must be taken to maintain the volume mixing ratio of 3:1 respectively as well as total compliance with the above mixing procedures.

**EP1119 Primer** shall be applied by spray to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun / gravity feed spray gun,  
nozzle size 1– 1.5 mm)

Spray viscosity: 24-28 sec. (Viscosity of prepared primer paint to be measured by Ford Cup 4)

Allow for drying

<u>Temp.</u>	<u>Touch dry</u>	<u>Hard dry</u>
10°C	1 h	18 h
20°C	½ h	6 h
30°C	½ h	4 h
60-70 °C		45-60 minutes

Touch dry shall be achieved in dust free environment.

Sanding of FRP panels for next layer of PU paint should not be done before hard dry.

Next coating interval is 7 days maximum

The dry film thickness shall be  $30 \pm 10 \mu\text{m}$ . The DFT shall be measured using a paint coating thickness Gauge for aluminium substrate and for the FRP a metallic painted panel shall be prepared daily and it's DFT shall be checked and this shall be kept as reference to verify the FRP panel DFT which is painted under similar conditions.

### **2.3.2: 2<sup>nd</sup> layer Putty application on defective portions of the panel (FRP only)**

The primed FRP panels shall be visually inspected. Check the surface for cracks, undulations, peel off, pin holes etc.

If defects are found, apply 2<sup>nd</sup> layer of putty over the defective portions following the procedure at 2.2.1.2

If no defects found, apply 2<sup>nd</sup> coat of epoxy primer

### **2.3.2: 2<sup>nd</sup> coat Epoxy primer application on entire surface**

Apply 2<sup>nd</sup> coat of primer following the procedure at 2.3.1.

After primer application, visually inspect the FRP surface and check for cracks, undulations, peel off, pin holes etc., If defects are found, reject the item. Otherwise PU finish painting shall be done.

If a defect is found after applying primer and the piece is to be used, all the primer layer should be removed first and process shall be re-started from the putty application stage.

## **2.4. Finish PU Coat Application**

After primer application as at 2.3 above, the panels shall be mechanically flattened/sanded using 400 grade sand paper to achieve a smooth and even surface.

All debris and dust from the flatting/sanding operation shall be removed by the use of compressed air.

Surfaces shall now be degreased, using thinner/ solvent, to remove any surface contamination resulting from the sanding operation.

Surfaces shall finally be solvent wiped using clean rags. Clean and dry surface shall be ensured prior to application of Finish paint.

Before application of finish paint, room conditions shall be checked. The humidity of the room shall be <85%. If humidity of room is  $\geq 85\%$ , then oven heat or hot air blow the panel.

**UT5119-Finish Coat** is a two component, Polyurethane resin based finish paint with excellent colour and gloss retention, workability and durability. The coating is supplied as a two pack system a base component UT5119 (A) and an activator component UT5119 (B).

The base component shall be thoroughly stirred until a uniform colour is produced. The activator shall then be added to the base component and then again thoroughly stirred for at least five minutes to produce a homogeneous mixture. The mixing ratio of base UT5119 (A): activator UT5119 (B) is 4:1 by volume.

Finally, the mixture of base and activator shall then be thinned with the appropriate amount of **037U Thinner** (30-60%). The thinned material shall then be thoroughly stirred before application

**UT5119 Finish coat** shall be applied by diaphragm pump spray gun / gravity feed spray gun to produce a smooth uniform film.

Dry air pressure: 5-7 kg/sq.cm (Diaphragm pump spray gun / gravity feed spray gun,  
nozzle size 1– 1.5 mm)

Spray viscosity : 20-24 sec.(Viscosity of prepared finish paint to be measured by Ford Cup 4)

Allow for drying

Temp.	Touch dry	Hard dry
10°C	½ h	6 h
60°C	-	1.5 h
80°C	-	1 h

In natural drying, touch dry shall be achieved in dust free environment. Forced drying can be done in baking oven

Sanding of FRP panels for next layer of PU paint should not be done before hard dry.

Next coating interval is 7 days maximum

The dry film thickness shall be  $30 \pm 10 \mu\text{m}$ . The DFT shall be measured using a paint coating thickness Gauge for aluminium substrate and for the GFRP a metallic painted panel shall be prepared daily and it's DFT shall be checked and this shall be kept as reference to verify the GFRP panel DFT which is painted under similar conditions.

The 1<sup>st</sup> coat finish painted FRP panels shall be visually inspected. Check the surface for cracks, undulations, peel off, pin holes etc. If defects are found, panel shall be rejected. If no defects found, apply 2<sup>nd</sup> coat of Clear finish coat as detailed at 2.5

## **2.5 Application of Polyurethane Clear Finish Coat**

**Polyurethane Clear** finish coat **UT 5119-A-Clear coat** is a two component coating supplied as a base component and activator component.

Before application, the following procedures must be observed.

The base component shall be thoroughly stirred and then the activator shall be added to the base component and again thoroughly stirred for at least two minutes to produce a homogeneous mixture.

**NOTE:** If only part quantities of the base and activator are to be used, care must be taken to maintain the volume mixing ratio of 4:1 respectively as well as total compliance with the above mixing procedures.

Finally, the mixture of base and activator shall then be thinned **Polyurethane Thinner 037U** and then again stirred thoroughly.

**Polyurethane Clear** finish coat shall be applied by spray to produce a smooth uniform film with the appropriate number of passes to achieve a dry film thickness (DFT) of 30 microns. The DFT will be measured using Paint coating thickness gauge.

If a defect is found after applying PU clear coat paint, and the panel is to be used, all the paint and primer layer should be removed first and process shall be re-started from the putty application stage.

**Visual Inspection of FRP painted panels :** The panels shall be inspected under illumination of 800 lux minimum. The panels shall be free from defects like orange peel, pin holes, finger prints, bubbles, shade difference, roughness, undulation, paint flow, scratch marks, etc., If defects are found, panel shall be rejected. The gloss level shall be measured using a Gloss meter

### **3. PERFORMANCE DATA**

#### **3.1 Mechanical Property**

<b>Property</b>	<b>Test result</b>	<b>Standard</b>
Scratch Resistance	No failure	BS 3900 Part E2, BS EN ISO 1518:2001
Chip Resistance	Class 2	BS AU 148 Part 15
Impact test (Falling ball)	No failure	BS 3900 Part E7
Abrasion resistance	Max 60 mg	ASTM D4060 CS10 wheel 500 cycles – 1000 gm load
Adhesion	5B	ASTM D 3359 (Method B)
Gloss Level	70-90(High-gloss)	BS EN ISO 2813:2000/ BS 3900
Film Hardness	H	ASTM D 3363
Anti-graffiti	Level 5	ASTM D 6578
Acid & Alkali Resistance	No defect	ISO 2812-1
Accelerated Weathering Test ( QUV x 500 hrs )	Gloss (60°)>90% $\Delta E < 2$	ASTM G155

#### **3.2 Fire Performance**

<b>Requirement set</b>	<b>Property</b>	<b>Test method reference</b>	<b>Parameter unit and</b>	<b>Criteria For HL3</b>
R17	Lateral flame spread	T02 ISO 5658-2	CFE (kW/m <sup>2</sup> )	Minimum 13
	Heat release rate	T03.01 ISO 5660-1: 50kW/m <sup>2</sup>	MARHE (kW/m <sup>2</sup> )	Maximum 60
	Smoke generation	T10.04 EN ISO 5659-2: 50kW/m <sup>2</sup>	D <sub>s</sub> max dimensionless	Maximum 300
	Toxicity	T11.01 EN ISO 5659-2: 50kW/m <sup>2</sup>	CIT <sub>G</sub> dimensionless	Maximum 1.5

## **PAINTING PROCEDURE FOR INTERNAL SURFACES OF BOGIE FRAME**

The interior surfaces of bogie frame sub-assemblies which form box sections like side frame and transom before closing with top plate shall be painted with heat resistant aluminium paint to grade-1 of IS.13183-91.

### **Painting Procedure**

- All surfaces should be thoroughly degreased using Thinner/Cleaning Solvent.
- The degreased surfaces shall be abrasive blasted to a minimum SA 2½ Standard for Steel (Mean Profile 45 microns).
- The areas to be welded shall be masked with a masking tape before painting.
- Within 4 hours after abrasive blasting, 1st coat of heat resistant aluminium paint to grade-1 of I.S.13183-91 shall be applied to the abrasive blasted surfaces and allowed to dry for 24 hrs. After 24 hrs, the second coat of aluminium paint shall be applied and allowed to dry overnight. The DFT shall be 40 microns nominal.

**PROCEDURE FOR ANTI-DRUMMING COMPOUND PAINTING**

**Under frame Painting:**

- 1) Mask the underframe bottom areas like cross member, jack pad, centre pivot area etc., using masking tape except the keystone plate area.
- 2) Check for environment working conditions: the surface temperature of the material to be painted should be 3°C higher than the dew point and humidity < 85%.
- 3) Clean the surface to be painted with solvent cleaner, to make surface free from oil, rust and grease.
- 4) The anti-drumming paint shall be applied to bottom of keystone plate (except the interface area between bolster and keystone plate or between cross beam and keystone plate) that could be easily accessed by spray gun.
- 5) Anti-drumming paint (INSONASTIC AQ NF) shall be applied to bottom of keystone plate using special high pressure airless spray gun.
- 6) Ensure entire surface of the accessible keystone plate area is covered with antidrumming paint.
- 7) Dry for about 24 hrs and remove masking tape.
- 8) Check for Dry film thickness (Please measure on the centre point of corrugation surface of keystone plate).
- 9) Dry film thickness(DFT) shall be 1000µm nominal (average thickness range : 800 ~ 1600 µm).





## INSONASTIC® AQ NF – Data Sheet

### DESCRIPTION

Single component coating based on copolymers in an aqueous emulsion for reinforced protection, vibration dampening and sound-proofing. INSONASTIC® AQ NF is applied in a single coat at high thickness.

### APPLICATION AREAS

Sound-proofing and vibration dampening protection for:

- Metal bodywork of rolling stock: coaches, wagons, trucks, etc.
- Compressor hoods, casings, ventilators, escalator steps, etc.
- Sheet metal, partitions, ducts, etc.
- Bonding of athermal panels

### APPROVALS

Sound dampening properties of INSONASTIC® AQ NF: the loss factor determined according to the DIN 53-440 Standard is 0.08 at 200 Hz for a DFT of around 1 mm (ALCTRA Laboratory test report).  
The product complies with the SNCF Standard: NF.F 19447.

Fire rating:

- ✓ M1, as per the Order of the 21 November 2002. CREPIM Laboratory test report.
- ✓ IS 15 in accordance with the requirements of the Federal Railroad Administration, as per ASTM E 162-06. BODYCOTE Laboratory test report
- ✓ Class 2 as per the BS 476 Standard – Part 7. BODYCOTE Laboratory test report.
- ✓ Complies with the EN 45545-2 : 2013 standard when assembled in a rockwool complex – CREPIM laboratory test report.

Smoke rating:

- ✓ F1. CREPIM Laboratory test report.
- ✓ Complies with the BS 6853 Standard : 1999 Appendix D, Clause D.8.4. BODYCOTE Laboratory test report.

### CHARACTERISTICS

Number of components	: 1
Colour of dry film	: Light beige
Appearance of dry film	: Matt
Density at 23°C	: Around 1.2 g/ml
Calculated dry solids (by volume)	: 59%

### NOMINAL DRY FILM THICKNESS

Spray: 1000 to 3000  $\mu\text{m}/\text{coat}^*$       Number of coats: 1

### THEORETICAL COVERAGE

Airless spray: 0.48  $\text{m}^2/\text{kg}$ , i.e. 0.59  $\text{m}^2/\text{l}$  for 1000  $\mu\text{m}$  DFT

### DRYING TIME (for 1000 $\mu\text{m}$ dry film and 50% relative humidity)

	At 10°C	At 20°C	At 40°C
Dust free	15 h	5 h	3 h
Hard dry	48 h	20 h	12 h
Fully dry *	14 days	8 days	5 days

\* Depending on the application parameters, the environment and the composition of the systems.



## INSONASTIC® AQ NF – Data Sheet

### OVER-COATING TIME (over itself, at the nominal thicknesses)

Temperature 20°C: Min. 24 h.

### CLEANING SOLVENT

Water (before drying).

### STANDARD PACKAGING

220 kg in drums.

Please consult us for other types of packaging.

### STORAGE

Use by date: For standard packaging, 12 months under shelter at a temperature between + 5°C and + 35°C in the original unopened packaging. Damaged by freezing.

### SURFACE PREPARATION

The substrate should be clean, dry and free of oil or grease.

Metal substrates: wire brush, scrape or preferably strip by projection of abrasive to a Sa 2.5 surface finish as per the ISO 8501-1 Standard, followed by careful removal of dust.

### PRODUCT PREPARATION

INSONASTIC® AQ NF is a single component ready to use product.

### STANDARD APPLICATION CONDITIONS

#### EQUIPMENT AND SETTINGS

Application equipment	Airless spray
Pump ratio	Min. 45/1
Nozzle	35 to 43/1000 in.
Air pressure	3 to 4 kg/cm <sup>2</sup>
Dilution (by weight)	None

AIR TEMPERATURE/RELATIVE HUMIDITY	SUBSTRATE TEMPERATURE	PRODUCT TEMPERATURE
	(3°C above the dew point)	
Min. T: + 5°C/Min. RH: 5%	Min. T: + 5°C	Min. T: + 5°C
Max. T: + 40°C/Max. RH: 85%	Max. T: + 40°C	Max. T: + 30°C


### HEALTH AND SAFETY

Flash point: None.

Always consult the legal labelling on the packaging and the material safety data sheet before use.

### SPECIFIC RECOMMENDATIONS

In the case of vibration dampening of rail coaches, the product should be applied over an appropriate primer at a theoretical coverage rate of 2 kg of wet film per m<sup>2</sup>.


	<b>PAINTING INSPECTION RECORD</b>		Doc. No.	<b>GR/TD/4390</b>
			Project:	<b>MRS1</b>
Name of item	<b>GRIT-BLASTING, PRIMER AND FINISH COAT OF BOGIE PAINTING</b>		Inspected by	Approved by
Drawing No.	<input type="checkbox"/> 525-83026 <input type="checkbox"/> 525-83027 <input type="checkbox"/> 525-83028 <input type="checkbox"/> 525-83029	Signature		
Serial No.	Type of Bogie <input type="checkbox"/> DMC <input type="checkbox"/> TC <input type="checkbox"/> MC	Date		
<b>BMRC-BF-M-</b>		Result		
<b>Insp. Equipment</b>	Naked Eye, Comparator of SIS SA 2 ½ & Paint Thickness Meter			


No.	Inspection Items		Acceptance Criteria	Test Results	Remarks
1	Degreasing/ Cleaning	Check oil, rust etc. on the surface to be coated	Free from oil, rust etc.		
2	Interior Surfaces	Surfaces to be welded	Shall be masked		Paint interior surfaces of side frame and transom with heat resistant Al paint to Gr-1 of IS 13183-91 before closing with top plate.
		Grit Blast	ISO 8501-1, Min. SA 2 ½ & Avg. 45µm.		
		Dry Film thickness	Nominal: 40 µm.		
3	Exterior Surfaces	Machined surfaces	Shall be masked		
		Grit Blast	ISO 8501-1, Min. SA 2 ½ & Avg. 45µm.		Mild Steel Grits
4	Primer Application	Environment conditions	Temperature: $\geq 3^{\circ}\text{C}$ Humidity: $< 85\%$		
		Dry Film thickness	$40 \leq t \leq 80 \mu\text{m}$ . Nominal: 60 µm.		Max.120 µm
		Check for unpainted, dirt, peel and run	Shall be good		
5	Finish Coat	Environment conditions	Temperature: $\geq 3^{\circ}\text{C}$ Humidity: $< 85\%$		
		Dry Film thickness	$40 \leq t \leq 80 \mu\text{m}$ . Nominal: 60 µm.		Max.120 µm
6	Total Dry Film Thickness (DFT)	Primer + Finish Paint	$80 \leq t \leq 160 \mu\text{m}$ . Nominal: 120 µm.		Max.240 µm
7	Adhesion Test	Adhesion of paint	5B of ASTM D 3359 (Method B)		

**Remarks:**

**1. Machined surfaces shall be protected with Anti-rust coating to spec. IS 1154-2000.**

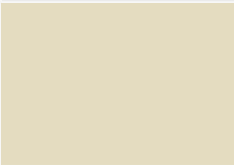
NCR Report, if any	Record no. <b>MRS1 690 BF PR 01</b>	Rev.	Page
		Nil	1/1

		<b>INSPECTION RECORD</b>		PROJECT: MRS1		
Name :		<b>GRIT BLASTING, PRIMER &amp; FINISH PAINTING OF BOLSTER &amp; CENTRE SILL ASSY.</b>		Ref. Doc	GR/TD/4390	
				Type of car	<input type="checkbox"/> DMC, <input type="checkbox"/> TC, <input type="checkbox"/> MC	
				Car No.		
Drawing No.		525-61008, 525-41012, 525-61009, 525-61011, 525-61012				
Insp. Equip.		Visual Inspection Comparator of SIS SA 2½ & Paint thickness meter		Revision Status Check		
Sl. No.	Inspection Items		Acceptance Criteria		Results	Remarks
1.	Degreasing/ Cleaning	Check oil, rust etc on the surface to be coated	Free from oil, rust etc.			Thinner or Solvent
2.	Surface preparation of Center Sill & Bolster Assy.	Grit Blast	ISO 8501-1, Min. SA 2 ½ & Avg.45µm.			Mild steel Grits
3.	Primer Application	Environmental conditions	Temperature : ≥ 3 °C Humidity : < 85%			
		Dry Film Thickness	40 ≤ t ≤ 80 µm (Dry) Nominal : 60 µm			Maximum 120 µm
		Check for unpainted, dirt, peel, and run	Shall be good			
4.	Finish Paint	Environmental conditions	Temperature : ≥ 3 °C Humidity : < 85%			Maximum 120 µm
		Dry Film Thickness	40 ≤ t ≤ 80 µm (Dry) Nominal : 60 µm			
5.	Total Dry Film Thickness (DFT)	Primer + Finish Paint	80 ≤ t ≤ 160 µm (Dry) Nominal : 120 µm			Maximum 240 µm
Remarks:  1. Paint not to be applied at Coupler mounting hole.						
NCR reports (if any)						
	Signature	Date	Result	Doc. No.	Rev	Sheet
Inspected By				<b>MRS1 690 MT UF 08</b>	Nil	1 of 1
Approved / Witness By						

		<b>INSPECTION RECORD</b>			PROJECT: MRS1		
Name :		<b>ANTI-DRUMMING NOISE SUPPRESSION PAINTING INSPECTION</b>			Ref. Doc	GR/TD/4390	
					Type of car	<input type="checkbox"/> DMC , <input type="checkbox"/> MC, <input type="checkbox"/> TC	
					Car. No.		
Drawing No:		525-40001, 525-40002, 525-40003					
Insp. Equip.		Visual Inspection Paint thickness meter		Revision Status Check			
Sl. No.	Inspection Items			Acceptance Criteria	Results	Remarks	
1.	Degreasing/ Cleaning	Check oil, rust etc on the surface to be coated		Free from oil, rust etc.		Thinner or Solvent	
2.	Paint (Under frame Key Stone)	Environmental conditions		Temperature : $\geq 3^{\circ}\text{C}$ Humidity : $< 85\%$			
		Dry Film Thickness (Mean Value)		$800 \leq t \leq 1600 \mu\text{m}$		Min. 600 $\mu\text{m}$ Max 2500 $\mu\text{m}$ (at Individual points)	
Remarks:  1. Paint not to be applied at Coupler mounting hole.							
NCR reports (if any)							
	Signature	Date	Result	Doc. No.	Rev	Sheet	
Inspected By				<b>MRS1 690 MT UF 07</b>	Nil	1 OF 1	
Approved / Witness By							

## NCS colour card

The colours at the monitor are approximately the RAL and NCS colour tonality. Please use the original RAL or NCS colour charts for precise colour reproduction.

					
S 0500-N	S 1000-N	S 1500-N	S 2000-N	S 2500-N	S 3000-N
					
S 3500-N	S 4000-N	S 4500-N	S 5000-N	S 5500-N	S 5500-N
					
S 6000-N	S 6500-N	S 7000-N	S 7500-N	S 8000-N	S 8500-N
					
S 9000-N	S 0502-Y	S 0502-Y50R	S 0502-R	S 0502-R50B	S 0502-B

S 0502-B50G	S 0502-G	S 0502-G50Y	S 1002-Y	S 1002-Y50R	S 1002-R
S 1002-R50B	S 1002-B	S 1002-B50G	S 1002-G	S 1002-G50Y	S 1502-Y
S 1502-Y50R	S 1502-R	S 1502-R50B	S 1502-B50G	S 1502-B	S 1502-G
S 1502-G50Y	S 0502-Y	S 1002-Y	S 1502-Y	S 2502-Y	S 3502-Y
S 4502-Y	S 5502-Y	S 6502-Y	S 7502-Y	S 8502-Y	S 0502-R
S 1002-R	S 1502-R	S 2502-R	S 3502-R	S 4502-R	S 5502-R

S 6502-R	S 7502-R	S 8502-R	S 0502-B	S 1002-B	S 1502-B
S 2502-B	S 3502-B	S 4502-B	S 5502-B	S 6502-B	S 7502-B
S 8502-B	S 0502-G	S 1002-G	S 1502-G	S 2502-G	S 3502-G
S 4502-G	S 5502-G	S 6502-G	S 7502-G	S 8502-G	S 0505-Y20R
S 1005-Y20R	S 2005-Y20R	S 3005-Y20R	S 4005-Y20R	S 5005-Y20R	S 6005-Y20R
S 7005-Y20R	S 8005-Y20R	S 8505-Y20R	S 0505-Y50R	S 1005-Y50R	S 2005-Y50R
S 3005-Y50R	S 4005-Y50R	S 5005-Y50R	S 6005-Y50R	S 7005-Y50R	S 8005-Y50R



S 0505-Y80R	S 1005-Y80R	S 2005-Y80R	S 3005-Y80R	S 4005-Y80R	S 5005-Y80R
S 6005-Y80R	S 7005-Y80R	S 8005-Y80R	S 8505-Y80R	S 0505-R20B	S 1005-R20B
S 2005-R20B	S 3005-R20B	S 4005-R20B	S 5005-R20B	S 6005-R20B	S 7005-R20B
S 8005-R20B	S 8505-R20B	S 0505-R50B	S 1005-R50B	S 2005-R50B	S 3005-R50B
S 4005-R50B	S 5005-R50B	S 6005-R50B	S 7005-R50B	S 8005-R50B	S 0505-R80B
S 1005-R80B	S 2005-R80B	S 3005-R80B	S 4005-R80B	S 5005-R80B	S 6005-R80B

S 7005-R80B	S 8005-R80B	S 8505-R80B	S 0505-B20G	S 1005-B20G	S 2005-B20G
					
S 3005-B20G	S 4005-B20G	S 5005-B20G	S 6005-B20G	S 7005-B20G	S 8005-B20G
					
S 8505-B20G	S 0505-B80G	S 1005-B80G	S 2005-B80G	S 3005-B80G	S 4005-B80G
					
S 5005-B80G	S 6005-B80G	S 7005-B80G	S 8005-B80G	S 8505-B80G	S 0505-G20Y
					
S 1005-G20Y	S 2005-G20Y	S 3005-G20Y	S 4005-G20Y	S 5005-G20Y	S 6005-G20Y
					
S 7005-G20Y	S 8005-G20Y	S 8505-G20Y	S 0505-G50Y	S 1005-G50Y	S 2005-G50Y
					
S 3005-G50Y	S 4005-G50Y	S 5005-G50Y	S 6005-G50Y	S 7005-G50Y	S 8005-G50Y
					

S 0505-G80Y	S 1005-G80Y	S 2005-G80Y	S 3005-G80Y	S 4005-G80Y	S 5005-G80Y
S 6005-G80Y	S 7005-G80Y	S 8005-G80Y	S 8505-G80Y	S 0505-Y	S 0505-Y10R
S 0505-Y20R	S 0505-Y30R	S 0505-Y40R	S 0505-Y50R	S 0505-Y60R	S 0505-Y70R
S 0505-Y80R	S 0505-Y90R	S 0510-Y	S 0510-Y10R	S 0510-Y20R	S 0510-Y30R
S 0510-Y40R	S 0510-Y50R	S 0510-Y60R	S 0510-Y70R	S 0510-Y80R	S 0510-Y90R
S 0520-Y	S 0520-Y10R	S 0520-Y20R	S 0520-Y30R	S 0520-Y40R	S 0520-Y50R

S 0520-Y60R	S 0520-Y70R	S 0520-Y80R	S 0520-Y90R	S 0530-Y	S 0530-Y10R
			Outcast shade.		
S 0530-Y20R	S 0530-Y30R	S 0530-Y40R	S 0530-Y50R	S 0530-Y60R	S 0530-Y70R
S 0530-Y80R	S 0530-Y90R	S 0540-Y	S 0540-Y10R	S 0540-Y20R	S 0540-Y30R
S 0540-Y40R	S 0540-Y50R	S 0540-Y60R	S 0540-Y70R	S 0540-Y80R	S 0540-Y90R
					Outcast shade.
S 0550-Y	S 0550-Y10R	S 0550-Y20R	S 0550-Y30R	S 0550-Y40R	S 0550-Y50R
	Outcast shade.				
S 0550-Y60R	S 0550-Y70R	S 0550-Y80R	S 0550-Y90R	S 0560-Y	S 0560-Y10R
	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	
S 0560-Y20R	S 0560-Y30R	S 0560-Y40R	S 0560-Y50R	S 0560-Y60R	S 0560-Y70R

Outcast shade.				Outcast shade.	Outcast shade.
S 0560-Y80R	S 0560-Y90R	S 0570-Y	S 0570-Y10R	S 0570-Y20R	S 0570-Y30R
Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	
S 0570-Y40R	S 0570-Y50R	S 0570-Y60R	S 0570-Y70R	S 0570-Y80R	S 0570-Y90R
Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.
S 0580-Y	S 0580-Y10R	S 0580-Y20R	S 0580-Y30R	S 0580-Y40R	S 0580-Y50R
Outcast shade.	Outcast shade.			Outcast shade.	Outcast shade.
S 0580-Y60R	S 0580-Y70R	S 0580-Y80R	S 0580-Y90R	S 0585-Y20R	S 0585-Y30R
Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	
S 0585-Y40R	S 0585-Y50R	S 0585-Y60R	S 0585-Y70R	S 0585-Y80R	S 1005-Y
S 1005-Y10R	S 1005-Y20R	S 1005-Y30R	S 1005-Y40R	S 1005-Y50R	S 1005-Y60R


S 1005-Y70R	S 1005-Y80R	S 1005-Y90R	S 1010-Y	S 1010-Y10R	S 1010-Y20R
S 1010-Y30R	S 1010-Y40R	S 1010-Y50R	S 1010-Y60R	S 1010-Y70R	S 1010-Y80R
S 1010-Y90R	S 1020-Y	S 1020-Y10R	S 1020-Y20R	S 1020-Y30R	S 1020-Y40R
S 1020-Y50R	S 1020-Y60R	S 1020-Y70R	S 1020-Y80R	S 1020-Y90R	S 1030-Y
S 1030-Y10R	S 1030-Y20R	S 1030-Y30R	S 1030-Y40R	S 1030-Y50R	S 1030-Y60R
S 1030-Y70R	S 1030-Y80R	S 1030-Y90R	S 1040-Y	S 1040-Y10R	S 1040-Y20R
S 1040-Y30R	S 1040-Y40R	S 1040-Y50R	S 1040-Y60R	S 1040-Y70R	S 1040-Y80R

S 1040-Y90R	S 1050-Y	S 1050-Y10R	S 1050-Y20R	S 1050-Y30R	S 1050-Y40R
S 1050-Y50R	S 1050-Y60R	S 1050-Y70R	S 1050-Y80R	S 1050-Y90R	S 1060-Y
S 1060-Y10R	S 1060-Y20R	S 1060-Y30R	S 1060-Y40R	S 1060-Y50R	S 1060-Y60R
S 1060-Y70R	S 1060-Y80R	S 1060-Y90R	S 1070-Y	S 1070-Y10R	S 1070-Y20R
S 1070-Y30R	S 1070-Y40R	S 1070-Y50R	S 1070-Y60R	S 1070-Y70R	S 1070-Y80R
	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.
S 1070-Y90R	S 1080-Y	S 1080-Y10R	S 1080-Y20R	S 1080-Y30R	S 1080-Y40R
Outcast shade.					

S 1080-Y50R	S 1080-Y60R	S 1080-Y70R	S 1080-Y80R	S 1080-Y90R	S 2005-Y
S 2005-Y10R	S 2005-Y20R	S 2005-Y30R	S 2005-Y40R	S 2005-Y50R	S 2005-Y60R
S 2005-Y70R	S 2005-Y80R	S 2005-Y90R	S 2010-Y	S 2010-Y10R	S 2010-Y20R
S 2010-Y30R	S 2010-Y40R	S 2010-Y50R	S 2010-Y60R	S 2010-Y70R	S 2010-Y80R
S 2010-Y90R	S 2020-Y	S 2020-Y10R	S 2020-Y20R	S 2020-Y30R	S 2020-Y40R
S 2020-Y50R	S 2020-Y60R	S 2020-Y70R	S 2020-Y80R	S 2020-Y90R	S 2030-Y
S 2030-Y10R	S 2030-Y20R	S 2030-Y30R	S 2030-Y40R	S 2030-Y50R	S 2030-Y60R



S 2030-Y70R	S 2030-Y80R	S 2030-Y90R	S 2040-Y	S 2040-Y10R	S 2040-Y20R
S 2040-Y30R	S 2040-Y40R	S 2040-Y50R	S 2040-Y60R	S 2040-Y70R	S 2040-Y80R
S 2040-Y90R	S 2050-Y	S 2050-Y10R	S 2050-Y20R	S 2050-Y30R	S 2050-Y40R
S 2050-Y50R	S 2050-Y60R	S 2050-Y70R	S 2050-Y80R	S 2050-Y90R	S 2060-Y
S 2060-Y10R	S 2060-Y20R	S 2060-Y30R	S 2060-Y40R	S 2060-Y50R	S 2060-Y60R
S 2060-Y70R	S 2060-Y80R	S 2060-Y90R	S 2070-Y	S 2070-Y10R	S 2070-Y20R

S 2070-Y30R	S 2070-Y40R	S 2070-Y50R	S 2070-Y60R	S 2070-Y70R	S 2070-Y80R
					
S 2070-Y90R	S 2075-Y60R	S 2075-Y70R	S 1580-Y80R	S 1580-Y90R	S 1085-Y80R
					
S 1085-Y90R	S 3010-Y	S 3010-Y10R	S 3010-Y20R	S 3010-Y30R	S 3010-Y40R
					
S 3010-Y50R	S 3010-Y60R	S 3010-Y70R	S 3010-Y80R	S 3010-Y90R	S 3020-Y
					
S 3020-Y10R	S 3020-Y20R	S 3020-Y30R	S 3020-Y40R	S 3020-Y50R	S 3020-Y60R
					
S 3020-Y60R	S 3020-Y70R	S 3020-Y80R	S 3020-Y90R	S 3030-Y	S 3030-Y10R
					
S 3030-Y20R	S 3030-Y30R	S 3030-Y40R	S 3030-Y50R	S 3030-Y60R	S 3030-Y70R
					

S 3030-Y80R	S 3030-Y90R	S 3040-Y	S 3040-Y10R	S 3040-Y20R	S 3040-Y30R
S 3040-Y40R	S 3040-Y50R	S 3040-Y60R	S 3040-Y70R	S 3040-Y80R	S 3040-Y90R
S 3050-Y	S 3050-Y10R	S 3050-Y20R	S 3050-Y30R	S 3050-Y40R	S 3050-Y50R
S 3050-Y60R	S 3050-Y70R	S 3050-Y80R	S 3050-Y90R	S 3060-Y	S 3060-Y10R
S 3060-Y20R	S 3060-Y30R	S 3060-Y40R	S 3060-Y50R	S 3060-Y60R	S 3060-Y70R
S 3060-Y80R	S 3060-Y90R	S 3065-Y20R	S 2570-Y30R	S 2570-Y40R	S 2570-Y50R

S 2570-Y60R	S 2570-Y70R	S 2570-Y80R	S 2570-Y90R	S 4010-Y10R	S 4010-Y30R
S 4010-Y40R	S 4010-Y70R	S 4010-Y90R	S 4020-Y	S 4020-Y10R	S 4020-Y20R
S 4020-Y30R	S 4020-Y40R	S 4020-Y50R	S 4020-Y60R	S 4020-Y70R	S 4020-Y80R
S 4020-Y90R	S 4030-Y	S 4030-Y10R	S 4030-Y20R	S 4030-Y30R	S 4030-Y40R
S 4030-Y50R	S 4030-Y60R	S 4030-Y70R	S 4030-Y80R	S 4030-Y90R	S 4040-Y
S 4040-Y10R	S 4040-Y20R	S 4040-Y30R	S 4040-Y40R	S 4040-Y50R	S 4040-Y60R
S 4040-Y70R	S 4040-Y90R	S 4050-Y	S 4050-Y10R	S 4050-Y20R	S 4050-Y30R

S 4050-Y40R	S 4050-Y50R	S 4050-Y60R	S 4050-Y70R	S 4050-Y80R	S 4050-Y90R
S 3560-Y	S 4055-Y10R	S 3560-Y20R	S 3560-Y30R	S 3560-Y40R	S 3560-Y50R
S 3560-Y60R	S 3560-Y70R	S 3560-Y80R	S 3560-Y90R	S 5010-Y10R	S 5010-Y30R
S 5010-Y50R	S 5010-Y70R	S 5010-Y90R	S 5020-Y	S 5020-Y10R	S 5020-Y20R
S 5020-Y30R	S 5020-Y40R	S 5020-Y50R	S 5020-Y60R	S 5020-Y70R	S 5020-Y80R
S 5020-Y90R	S 5030-Y	S 5030-Y10R	S 5030-Y20R	S 5030-Y30R	S 5030-Y40R

S 5030-Y50R	S 5030-Y60R	S 5030-Y70R	S 5030-Y80R	S 5030-Y90R	S 5040-Y
					
S 5040-Y10R	S 5040-Y20R	S 5040-Y30R	S 5040-Y40R	S 5040-Y50R	S 5040-Y60R
					
S 5040-Y70R	S 5040-Y80R	S 5040-Y90R	S 4550-Y	S 4550-Y30R	S 4550-Y40R
					
S 4550-Y50R	S 4550-Y60R	S 4550-Y70R	S 4550-Y80R	S 4550-Y90R	S 6010-Y10R
					
S 6010-Y30R	S 6010-Y50R	S 6010-Y70R	S 6010-Y90R	S 6020-Y	S 6020-Y10R
					
S 6020-Y20R	S 6020-Y30R	S 6020-Y40R	S 6020-Y50R	S 6020-Y60R	S 6020-Y70R
					
S 6020-Y80R	S 6020-Y90R	S 6030-Y	S 6030-Y10R	S 6030-Y20R	S 6030-Y30R
					

S 6030-Y40R	S 6030-Y50R	S 6030-Y60R	S 6030-Y70R	S 6030-Y80R	S 6030-Y90R
S 7010-Y10R	S 7010-Y30R	S 7010-Y50R	S 7010-Y70R	S 7010-Y90R	S 7020-Y
S 7020-Y10R	S 7020-Y20R	S 7020-Y30R	S 7020-Y40R	S 7020-Y50R	S 7020-Y60R
S 7020-Y70R	S 7020-Y80R	S 7020-Y90R	S 8010-Y10R	S 8010-Y30R	S 8010-Y50R
S 8010-Y70R	S 8010-Y90R	S 5540-Y90R	S 0505-R	S 0505-R10B	S 0505-R20B
S 0505-R30B	S 0505-R40B	S 0505-R50B	S 0505-R60B	S 0505-R70B	S 0505-R80B

S 0505-R90B	S 0510-R	S 0510-R10B	S 0510-R20B	S 0510-R30B	S 0510-R40B
S 0510-R50B	S 0510-R60B	S 0510-R70B	S 0510-R80B	S 0510-R90B	S 0520-R
S 0520-R10B	S 0520-R20B	S 0520-R30B	S 0520-R40B	S 0520-R50B	S 0520-R60B
S 0520-R70B	S 0520-R80B	S 0520-R90B	S 0530-R	S 0530-R10B	S 0530-R20B
S 0530-R30B	S 0530-R40B	S 0530-R50B	S 0530-R60B	S 0530-R70B	S 0530-R80B
				Outcast shade.	
S 0530-R90B	S 0540-R	S 0540-R10B	S 0540-R20B	S 0540-R30B	S 0540-R90B
S 0550-R	S 0550-R10B	S 0560-R	S 0565-R	S 1005-R	S 1005-R10B











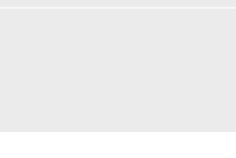
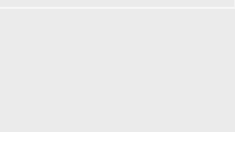
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S 1005-R80B	S 1005-R90B	S 1010-R	S 1010-R10B	S 1010-R20B	S 1010-R30B
S 1010-R40B	S 1010-R50B	S 1010-R60B	S 1010-R70B	S 1010-R80B	S 1010-R90B
S 1020-R	S 1020-R10B	S 1020-R20B	S 1020-R30B	S 1020-R40B	S 1020-R50B
S 1020-R60B	S 1020-R70B	S 1020-R80B	S 1020-R90B	S 1030-R	S 1030-R10B
S 1030-R20B	S 1030-R30B	S 1030-R40B	S 1030-R50B	S 1030-R60B	S 1030-R70B
					Outcast shade.

S 1030-R80B	S 1030-R90B	S 1040-R	S 1040-R10B	S 1040-R20B	S 1040-R30B
	Outcast shade.	Outcast shade.			
S 1040-R40B	S 1040-R50B	S 1040-R60B	S 1040-R70B	S 1040-R80B	S 1040-R90B
			Outcast shade.	Outcast shade.	
S 1050-R	S 1050-R10B	S 1050-R20B	S 1050-R30B	S 1050-R40B	S 1550-R70B
				Outcast shade.	
S 1550-R80B	S 1050-R90B	S 1060-R	S 1060-R10B	S 1060-R20B	S 1060-R30B
			Outcast shade.		
S 1555-R70B	S 1555-R80B	S 1560-R90B	S 1070-R	S 1070-R10B	S 1070-R20B
S 1080-R	S 2005-R	S 2005-R10B	S 2005-R20B	S 2005-R30B	S 2005-R40B
S 2005-R50B	S 2005-R60B	S 2005-R70B	S 2005-R80B	S 2005-R90B	S 2010-R

S 2010-R10B	S 2010-R20B	S 2010-R30B	S 2010-R40B	S 2010-R50B	S 2010-R60B
S 2010-R70B	S 2010-R80B	S 2010-R90B	S 2020-R	S 2020-R10B	S 2020-R20B
S 2020-R30B	S 2020-R40B	S 2020-R50B	S 2020-R60B	S 2020-R70B	S 2020-R80B
S 2020-R90B	S 2030-R	S 2030-R10B	S 2030-R20B	S 2030-R30B	S 2030-R40B
S 2030-R50B	S 2030-R60B	S 2030-R70B	S 2030-R80B	S 2030-R90B	S 2040-R
S 2040-R10B	S 2040-R20B	S 2040-R30B	S 2040-R40B	S 2040-R50B	S 2040-R60B

S 2040-R70B	S 2040-R80B	S 2040-R90B	S 2050-R	S 2050-R10B	S 2050-R20B
Outcast shade.	Outcast shade.	Outcast shade.	Outcast shade.		
S 2050-R30B	S 2050-R40B	S 2050-R50B	S 2050-R60B	S 2050-R70B	S 2050-R80B
			Outcast shade.		
S 2050-R90B	S 2060-R	S 2060-R10B	S 2060-R20B	S 2060-R30B	S 2060-R40B
				Outcast shade.	
S 2060-R70B	S 2060-R80B	S 2060-R90B	S 2070-R	S 2070-R10B	S 2065-R20B
Outcast shade.		Outcast shade.			
S 1580-R	S 2565-R80B	S 2065-R90B	S 3010-R	S 3010-R10B	S 3010-R20B
S 3010-R30B	S 3010-R40B	S 3010-R50B	S 3010-R60B	S 3010-R70B	S 3010-R80B
S 3010-R90B	S 3020-R	S 3020-R10B	S 3020-R20B	S 3020-R30B	S 3020-R40B

S 3020-R50B	S 3020-R60B	S 3020-R70B	S 3020-R80B	S 3020-R90B	S 3030-R
S 3030-R10B	S 3030-R20B	S 3030-R30B	S 3030-R40B	S 3030-R50B	S 3030-R60B
S 3030-R70B	S 3030-R80B	S 3030-R90B	S 3040-R	S 3040-R10B	S 3040-R20B
S 3040-R30B	S 3040-R40B	S 3040-R50B	S 3040-R60B	S 3040-R70B	S 3040-R80B
S 3040-R90B	S 3050-R	S 3050-R10B	S 3050-R20B	S 3050-R30B	S 3050-R40B
S 3050-R50B	S 3050-R60B	S 3050-R70B	S 3050-R80B	S 3050-R90B	S 3060-R

S 3060-R10B	S 3060-R20B	S 3055-R30B	S 3055-R40B	S 3055-R50B	S 3055-R60B
					
S 3060-R70B	S 3060-R80B	S 3060-R90B	S 2570-R	S 3065-R90B	S 4010-R10B
					
S 4010-R30B	S 4010-R50B	S 4010-R70B	S 4010-R90B	S 4020-R	S 4020-R10B
					
S 4020-R20B	S 4020-R30B	S 4020-R40B	S 4020-R50B	S 4020-R60B	S 4020-R70B
					
S 4020-R80B	S 4020-R90B	S 4030-R	S 4030-R10B	S 4030-R20B	S 4030-R30B
					
S 4030-R40B	S 4030-R50B	S 4030-R60B	S 4030-R70B	S 4030-R80B	S 4030-R90B
					
S 4040-R	S 4040-R10B	S 4040-R20B	S 4040-R30B	S 4040-R40B	S 4040-R50B
					

S 4040-R60B	S 4040-R70B	S 4040-R80B	S 4040-R90B	S 4050-R	S 4050-R10B
Outcast shade.		Outcast shade.	Outcast shade.		
S 4050-R20B	S 4050-R30B	S 4050-R40B	S 4050-R50B	S 4050-R60B	S 4050-R70B
S 4050-R80B	S 4050-R90B	S 3560-R	S 4055-R70B	S 4055-R80B	S 4055-R90B
S 5010-R10B	S 5010-R30B	S 5010-R50B	S 5010-R70B	S 5010-R90B	S 5020-R
S 5020-R10B	S 5020-R20B	S 5020-R30B	S 5020-R40B	S 5020-R50B	S 5020-R60B
S 5020-R70B	S 5020-R80B	S 5020-R90B	S 5030-R	S 5030-R10B	S 5030-R20B

S 5030-R30B	S 5030-R40B	S 5030-R50B	S 5030-R60B	S 5030-R70B	S 5030-R80B
				Outcast shade.	Outcast shade.
S 5030-R90B	S 5040-R	S 5040-R10B	S 5040-R20B	S 5040-R30B	S 5040-R40B
					
S 5040-R50B	S 5040-R60B	S 5040-R70B	S 5040-R80B	S 5040-R90B	S 4550-R70B
					
S 4550-R80B	S 4550-R90B	S 5540-R70B	S 5540-R90B	S 6010-R10B	S 6010-R30B
					
S 6010-R50B	S 6010-R70B	S 6010-R90B	S 6020-R	S 6020-R10B	S 6020-R20B
					
S 6020-R30B	S 6020-R40B	S 6020-R50B	S 6020-R60B	S 6020-R70B	S 6020-R80B
					
S 6020-R90B	S 6030-R	S 6030-R10B	S 6030-R20B	S 6030-R30B	S 6030-R40B
					



S 6030-R50B	S 6030-R60B	S 6030-R70B	S 6030-R80B	S 6030-R90B	S 7010-R10B
S 7010-R30B	S 7010-R50B	S 7010-R70B	S 7010-R90B	S 8010-R10B	S 8010-R30B
S 8010-R50B	S 8010-R70B	S 8010-R90B	S 7020-R	S 7020-R10B	S 7020-R20B
S 7020-R30B	S 7020-R40B	S 7020-R50B	S 7020-R60B	S 7020-R70B	S 7020-R80B
S 7020-R90B	S 0505-B	S 0505-B20G	S 0505-B50G	S 0505-B80G	S 0510-B
S 0510-B10G	S 0510-B30G	S 0510-B50G	S 0510-B70G	S 0510-B90G	S 0520-B
S 0520-B10G	S 0520-B30G	S 0520-B50G	S 0520-B70G	S 0520-B90G	S 0530-B

S 0530-B10G	S 0530-B30G	S 0530-B50G	S 0530-B70G	S 0530-B90G	S 0540-B
S 0540-B10G	S 0540-B30G	S 1005-B	S 1005-B20G	S 1005-B50G	S 1005-B80G
S 1010-B	S 1010-B10G	S 1010-B30G	S 1010-B50G	S 1010-B70G	S 1010-B90G
S 1020-B	S 1020-B10G	S 1020-B30G	S 1020-B50G	S 1020-B70G	S 1020-B90G
S 1030-B	S 1030-B10G	S 1030-B30G	S 1030-B50G	S 1030-B70G	S 1030-B90G
S 1040-B	S 1040-B10G	S 1040-B20G	S 1040-B30G	S 1040-B40G	S 1040-B50G
S 1040-B60G	S 1040-B70G	S 1040-B80G	S 1040-B90G	S 1050-B	S 1050-B10G

S 1050-B20G	S 1050-B30G	S 1050-B40G	S 1050-B50G	S 1050-B60G	S 1050-B70G
		Outcast shade.		Outcast shade.	
S 1050-B80G	S 1050-B90G	S 1060-B	S 1060-B10G	S 1565-B	S 1055-B90G
S 2005-B	S 2005-B20G	S 2005-B50G	S 2005-B80G	S 2010-B	S 2010-B10G
S 2010-B30G	S 2010-B50G	S 2010-B70G	S 2010-B90G	S 2020-B	S 2020-B10G
S 2020-B30G	S 2020-B50G	S 2020-B70G	S 2020-B90G	S 2030-B	S 2030-B10G
S 2030-B30G	S 2030-B50G	S 2030-B70G	S 2030-B90G	S 2040-B	S 2040-B10G
S 2040-B20G	S 2040-B30G	S 2040-B40G	S 2040-B50G	S 2040-B60G	S 2040-B60G

S 2040-B70G	S 2040-B80G	S 2040-B90G	S 2050-B	S 2050-B10G	S 2050-B20G
S 2050-B30G	S 2050-B40G	S 2050-B50G	S 2050-B60G	S 2050-B70G	S 2050-B80G
S 2050-B90G	S 2060-B	S 2055-B10G	S 2555-B20G	S 2555-B30G	S 2555-B40G
S 2060-B50G	S 2555-B60G	S 2060-B70G	S 2555-B80G	S 2060-B90G	S 3010-B
S 3010-B10G	S 3010-B30G	S 3010-B50G	S 3010-B70G	S 3010-B90G	S 3020-B
S 3020-B10G	S 3020-B30G	S 3020-B50G	S 3020-B70G	S 3020-B90G	S 3030-B
S 3030-B10G	S 3030-B30G	S 3030-B50G	S 3030-B70G	S 3030-B90G	S 3040-B

S 3040-B10G	S 3040-B20G	S 3040-B30G	S 3040-B40G	S 3040-B50G	S 3040-B60G
S 3040-B70G	S 3040-B80G	S 3040-B90G	S 3050-B	S 3050-B10G	S 3050-B20G
S 3050-B30G	S 3050-B40G	S 3050-B50G	S 3050-B60G	S 3050-B70G	S 3050-B80G
S 3050-B90G	S 3060-B	S 3060-B10G	S 3060-B20G	S 3060-B30G	S 3060-B40G
		Outcast shade.		Outcast shade.	
S 3055-B50G	S 3555-B60G	S 3060-B70G	S 3555-B80G	S 3060-B90G	S 4010-B10G
S 4010-B30G	S 4010-B50G	S 4010-B70G	S 4010-B90G	S 4020-B	S 4020-B10G
S 4020-B30G	S 4020-B90G	S 4030-B	S 4030-B10G	S 4030-B30G	S 4030-B50G

S 4030-B70G	S 4030-B90G	S 4040-B	S 4040-B10G	S 4040-B20G	S 4040-B30G
S 4040-B40G	S 4040-B50G	S 4040-B60G	S 4040-B70G	S 4040-B80G	S 4040-B90G
S 4050-B	S 4050-B10G	S 4050-B20G	S 4050-B30G	S 4050-B40G	S 4050-B50G
S 4050-B60G	S 4050-B70G	S 4050-B80G	S 4050-B90G	S 4055-B	S 2065-B
Outcast shade.					
S 4055-B40G	S 5010-B10G	S 5010-B30G	S 5010-B50G	S 5010-B70G	S 5010-B90G
S 5020-B	S 5020-B10G	S 5020-B30G	S 5020-B50G	S 5020-B70G	S 5020-B90G
S 5030-B	S 5030-B10G	S 5030-B30G	S 5030-B50G	S 5030-B70G	S 5030-B90G

S 5040-B	S 5040-B10G	S 5040-B20G	S 5040-B30G	S 5040-B40G	S 5040-B50G
S 5040-B60G	S 5040-B70G	S 5040-B80G	S 5040-B90G	S 4550-B	S 5045-B10G
				Outcast shade.	Outcast shade.
S 4550-B20G	S 4550-B30G	S 4550-B40G	S 4550-B50G	S 4550-B80G	S 4550-B90G
S 6010-B10G	S 6010-B30G	S 6010-B50G	S 6010-B70G	S 6010-B90G	S 6020-B
S 6020-B10G	S 6020-B30G	S 6020-B50G	S 6020-B70G	S 6020-B90G	S 6030-B
S 6030-B10G	S 6030-B30G	S 6030-B50G	S 6030-B70G	S 6030-B90G	S 5540-B
S 5540-B10G	S 5540-B20G	S 5540-B30G	S 5540-B40G	S 5540-B50G	S 6035-B60G

Outcast shade.	Outcast shade.				
S 5540-B80G	S 5540-B90G	S 7010-B10G	S 7010-B30G	S 7010-B50G	S 7010-B70G
S 7010-B90G	S 7020-B	S 7020-B10G	S 7020-B30G	S 7020-B50G	S 7020-B70G
S 7020-B90G	S 6530-B30G	S 6530-B50G	S 8010-B10G	S 8010-B30G	S 8010-B50G
S 8010-B70G	S 8010-B90G	S 0505-G	S 0505-G10Y	S 0505-G20Y	S 0505-G30Y
S 0505-G40Y	S 0505-G50Y	S 0505-G60Y	S 0505-G70Y	S 0505-G80Y	S 0505-G90Y
S 0510-G	S 0510-G10Y	S 0510-G20Y	S 0510-G30Y	S 0510-G40Y	S 0510-G50Y
S 0510-G60Y	S 0510-G70Y	S 0510-G80Y	S 0510-G90Y	S 0520-G	S 0520-G10Y



S 0520-G20Y	S 0520-G30Y	S 0520-G40Y	S 0520-G50Y	S 0520-G60Y	S 0520-G70Y
S 0520-G80Y	S 0520-G90Y	S 0530-G	S 0530-G10Y	S 0530-G20Y	S 0530-G30Y
S 0530-G40Y	S 0530-G50Y	S 0530-G60Y	S 0530-G70Y	S 0530-G80Y	S 0530-G90Y
S 0540-G	S 0540-G10Y	S 0540-G20Y	S 0540-G30Y	S 0540-G40Y	S 0540-G50Y
S 0540-G60Y	S 0540-G70Y	S 0540-G80Y	S 0540-G90Y	S 0550-G10Y	S 0550-G20Y
S 0550-G30Y	S 0550-G40Y	S 0550-G50Y	S 0550-G60Y	S 0550-G70Y	S 0550-G80Y
S 0550-G90Y	S 0560-G10Y	S 0560-G20Y	S 0560-G30Y	S 0560-G40Y	S 0560-G50Y

S 0560-G60Y	S 0560-G70Y	S 0560-G80Y	S 0560-G90Y	S 0565-G10Y	S 0570-G20Y
S 0570-G30Y	S 0570-G40Y	S 0565-G50Y	S 0570-G60Y	S 0570-G70Y	S 0570-G80Y
S 0570-G90Y	S 0575-G20Y	S 0580-G30Y	S 0575-G40Y	S 0575-G60Y	S 0575-G70Y
S 0575-G90Y	S 1005-G	S 1005-G10Y	S 1005-G20Y	S 1005-G30Y	S 1005-G40Y
S 1005-G50Y	S 1005-G60Y	S 1005-G70Y	S 1005-G80Y	S 1005-G90Y	S 1010-G
S 1010-G10Y	S 1010-G20Y	S 1010-G30Y	S 1010-G40Y	S 1010-G50Y	S 1010-G60Y
S 1010-G70Y	S 1010-G80Y	S 1010-G90Y	S 1020-G	S 1020-G10Y	S 1020-G20Y

S 1020-G30Y	S 1020-G40Y	S 1020-G50Y	S 1020-G60Y	S 1020-G70Y	S 1020-G80Y
S 1020-G90Y	S 1030-G	S 1030-G10Y	S 1030-G20Y	S 1030-G30Y	S 1030-G40Y
S 1030-G50Y	S 1030-G60Y	S 1030-G70Y	S 1030-G80Y	S 1030-G90Y	S 1040-G
S 1040-G10Y	S 1040-G20Y	S 1040-G30Y	S 1040-G40Y	S 1040-G50Y	S 1040-G60Y
S 1040-G70Y	S 1040-G80Y	S 1040-G90Y	S 1050-G	S 1050-G10Y	S 1050-G20Y
S 1050-G30Y	S 1050-G40Y	S 1050-G50Y	S 1050-G60Y	S 1050-G70Y	S 1050-G80Y
S 1050-G90Y	S 1060-G	S 1060-G10Y	S 1060-G20Y	S 1060-G30Y	S 1060-G40Y

S 1060-G50Y	S 1060-G60Y	S 1060-G70Y	S 1060-G80Y	S 1060-G90Y	S 1565-G
S 1070-G10Y	S 1070-G20Y	S 1070-G30Y	S 1070-G40Y	S 1070-G50Y	S 1070-G60Y
				Outcast shade.	
S 1070-G70Y	S 1070-G80Y	S 1070-G90Y	S 1075-G20Y	S 1080-G30Y	S 1075-G40Y
S 1075-G50Y	S 1075-G60Y	S 1075-G70Y	S 1075-G80Y	S 1075-G90Y	S 2005-G
S 2005-G10Y	S 2005-G20Y	S 2005-G30Y	S 2005-G40Y	S 2005-G50Y	S 2005-G60Y
S 2005-G70Y	S 2005-G80Y	S 2005-G90Y	S 2010-G	S 2010-G10Y	S 2010-G20Y
S 2010-G30Y	S 2010-G40Y	S 2010-G50Y	S 2010-G60Y	S 2010-G70Y	S 2010-G80Y

S 2010-G90Y	S 2020-G	S 2020-G10Y	S 2020-G20Y	S 2020-G30Y	S 2020-G40Y
S 2020-G50Y	S 2020-G60Y	S 2020-G70Y	S 2020-G80Y	S 2020-G90Y	S 2030-G
S 2030-G10Y	S 2030-G20Y	S 2030-G30Y	S 2030-G40Y	S 2030-G50Y	S 2030-G60Y
S 2030-G70Y	S 2030-G80Y	S 2030-G90Y	S 2040-G	S 2040-G10Y	S 2040-G20Y
S 2040-G30Y	S 2040-G40Y	S 2040-G50Y	S 2040-G60Y	S 2040-G70Y	S 2040-G80Y
S 2040-G90Y	S 2050-G	S 2050-G10Y	S 2050-G20Y	S 2050-G30Y	S 2050-G40Y
S 2050-G50Y	S 2050-G60Y	S 2050-G70Y	S 2050-G80Y	S 2050-G90Y	S 2060-G

S 2060-G10Y	S 2060-G20Y	S 2060-G30Y	S 2060-G40Y	S 2060-G50Y	S 2060-G60Y
S 2060-G70Y	S 2060-G80Y	S 2060-G90Y	S 2565-G	S 2070-G10Y	S 2070-G20Y
S 2070-G30Y	S 2070-G40Y	S 2070-G50Y	S 2070-G60Y	S 2070-G70Y	S 2070-G80Y
Outcast shade.	Outcast shade.	Outcast shade.			
S 2070-G90Y	S 2075-G20Y	S 2075-G30Y	S 3010-G	S 3010-G10Y	S 3010-G20Y
S 3010-G30Y	S 3010-G40Y	S 3010-G50Y	S 3010-G60Y	S 3010-G70Y	S 3010-G80Y
S 3010-G90Y	S 3020-G	S 3020-G10Y	S 3020-G20Y	S 3020-G30Y	S 3020-G40Y
S 3020-G50Y	S 3020-G60Y	S 3020-G70Y	S 3020-G80Y	S 3020-G90Y	S 3030-G

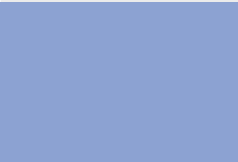
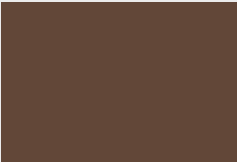
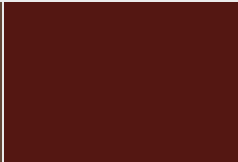
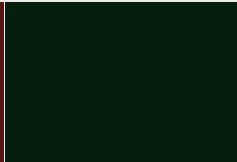

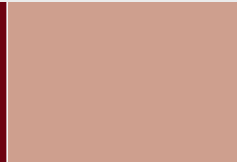


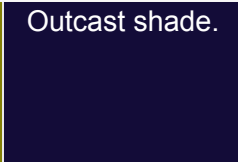





S 3030-G10Y	S 3030-G20Y	S 3030-G30Y	S 3030-G40Y	S 3030-G50Y	S 3030-G60Y
S 3030-G70Y	S 3030-G80Y	S 3030-G90Y	S 3040-G	S 3040-G10Y	S 3040-G20Y
S 3040-G30Y	S 3040-G40Y	S 3040-G50Y	S 3040-G60Y	S 3040-G70Y	S 3040-G80Y
S 3040-G90Y	S 3050-G	S 3050-G10Y	S 3050-G20Y	S 3050-G30Y	S 3050-G40Y
S 3050-G50Y	S 3050-G60Y	S 3050-G70Y	S 3050-G80Y	S 3050-G90Y	S 3060-G
S 3060-G10Y	S 3060-G20Y	S 3060-G30Y	S 3060-G40Y	S 3060-G50Y	S 3060-G60Y
			Outcast shade.		
S 3060-G70Y	S 3060-G80Y	S 3060-G90Y	S 3065-G10Y	S 2570-G20Y	S 2570-G30Y

S 3065-G40Y	S 3065-G50Y	S 3065-G60Y	S 4010-G10Y	S 4010-G30Y	S 4010-G50Y
S 4010-G70Y	S 4010-G90Y	S 4020-G	S 4020-G10Y	S 4020-G30Y	S 4020-G50Y
S 4020-G70Y	S 4020-G90Y	S 4030-G	S 4030-G10Y	S 4030-G30Y	S 4030-G50Y
S 4030-G70Y	S 4030-G90Y	S 4040-G	S 4040-G10Y	S 4040-G20Y	S 4040-G30Y
S 4040-G40Y	S 4040-G50Y	S 4040-G60Y	S 4040-G70Y	S 4040-G80Y	S 4040-G90Y
S 4050-G	S 4050-G10Y	S 4050-G20Y	S 4050-G30Y	S 4050-G40Y	S 4050-G50Y
				Outcast shade.	Outcast shade.
S 4050-G60Y	S 4050-G70Y	S 4050-G80Y	S 4050-G90Y	S 3560-G	S 3560-G10Y



S 3560-G20Y	S 3560-G30Y	S 3560-G40Y	S 3560-G50Y	S 3560-G60Y	S 3560-G70Y
S 5010-G10Y	S 5010-G30Y	S 5010-G50Y	S 5010-G70Y	S 5010-G90Y	S 5020-G
S 5020-G10Y	S 5020-G30Y	S 5020-G50Y	S 5020-G70Y	S 5020-G90Y	S 5030-G
S 5030-G10Y	S 5030-G30Y	S 5030-G50Y	S 5030-G70Y	S 5030-G90Y	S 5040-G
S 5040-G20Y	S 5040-G30Y	S 5040-G40Y	S 5040-G50Y	S 5040-G60Y	S 5040-G70Y
		Outcast shade.			
S 5040-G80Y	S 5040-G90Y	S 4550-G	S 4550-G10Y	S 4550-G20Y	S 4550-G30Y
S 4550-G40Y	S 4550-G50Y	S 4550-G60Y	S 4550-G70Y	S 6010-G10Y	S 6010-G30Y

S 6010-G50Y	S 6010-G70Y	S 6010-G90Y	S 6020-G	S 6020-G10Y	S 6020-G30Y
S 6020-G50Y	S 6020-G70Y	S 6020-G90Y	S 6030-G	S 6030-G10Y	S 6030-G30Y
S 6030-G50Y	S 6030-G70Y	S 6030-G90Y	S 5540-G	S 5540-G10Y	S 5540-G20Y
S 5540-G30Y	S 5540-G40Y	S 5540-G50Y	S 5540-G60Y	S 5540-G70Y	S 7010-G10Y
S 7010-G30Y	S 7010-G50Y	S 7010-G70Y	S 7010-G90Y	S 7020-G	S 7020-G10Y
S 7020-G30Y	S 7020-G50Y	S 7020-G70Y	S 7020-G90Y	S 6530-G10Y	S 6530-G50Y
S 8010-G10Y	S 8010-G30Y	S 8010-G50Y	S 8010-G70Y	S 8010-G90Y	S 0525-R60B

					Outcast shade. 	
	S 0525-R70B	S 4010-Y50R	S 4040-Y80R	S 5040-G10Y	S 1575-R10B	S 1010-Y80R
			Outcast shade. 			
	S 5040-R90B	S 1070-G60Y	S 3555-R60B	S 3560-R80B	S 3560-R90B	S 1555-B10G
						
	S 4020-B50G	S 4020-B70G				



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