	PERFORMANCE SPECIFICATION	AS/BGH/P01
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REPAINTING OF **BELMOND GRAND HIBERNIAN** **RAIL VEHICLES**

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APPROVAL AND AUTHORISATION

Signature

Job Title

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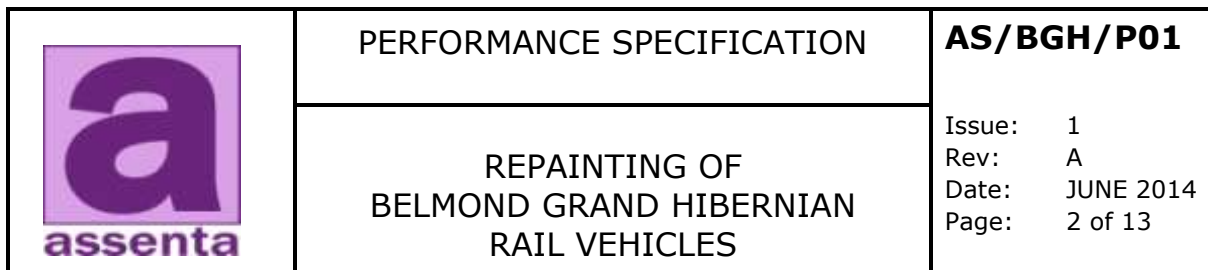
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ISSUE / REVISION RECORD

This procedure will be updated when necessary by issue of the complete document


The amended or additional parts will be marked with vertical black lines as shown thus.

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1. INTRODUCTION

This specification details the performance requirements for complete paint systems, including all substrate materials, when applied to the exterior of rail vehicle bodysells at overhauls, repairs and re-branding. Where the term 'paint system' is used in this specification, it shall be taken to mean the sum of the various coats of paint applied to the vehicle, including any previously applied coats that may not be completely removed prior to repainting.


When repainting vehicles, Contractors are required to select a paint system offering the optimum combination of benefits to the Customer in terms of corrosion protection, durability, quality of appearance and whole life cost. The Contractor is also required to submit a detailed response to this specification, stating clearly how each of its requirements is to be met.

2. LIFE OF PAINT SYSTEM

- 2.1 The applied paint system shall, as a minimum, protect the vehicle bodysell against corrosion, whilst providing a high quality appearance, for the specified service life as defined in the relevant Vehicle Overhaul Instruction or as defined in the Contract.

Where a Contractor can see an obvious benefit to the Customer, the Contractor should offer a paint system capable of providing enhanced protection against corrosion or capable of extending the specified service life.

- 2.2 Where a gloss finish is specified it shall be taken to mean 80-85% gloss at a gloss head angle of 20° in accordance with BS EN ISO 2813: 2000. Degradation of the gloss level shall be minimal over the service life of the paint system and shall not be greater than 10% over a period of 8 years.
- 2.3 The livery colours shall be retained with minimal degradation over the service life of the paint system. The maximum permissible colour fade shall be 3 units over a period of 8 years in accordance with ASTM D 4587, Cycle B.
- 2.4 Colour reference panels of the chosen paint system shall be prepared by the Contractor for each of the livery colours and shall be submitted to the Customer for approval prior to application to a vehicle. The panels shall be endorsed as approved by all relevant parties, then stored by the Contractor under controlled conditions for the service life of the paint system. The panels will be used as a

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reference for gloss and colour degradation in the event of there being any disagreement between the parties with regard to the performance of the paint system.

- 2.5 The above requirements shall be met with no scheduled maintenance of the paint system other than routine cleaning and minor damage repair in accordance with Section 9 of this specification within 28 days of damage occurring. Routine cleaning shall be taken to mean the use of a washing plant and hand washing with a brush, using cleaning agents approved by Belmond for the specific purpose. The typical cleaning agents used for the exterior surfaces of rail vehicles are listed in Appendix B.

The frequency of routine cleaning shall be assumed to be daily.

3. SUBSTRATE COMPATIBILITY

- 3.1 The paint system shall be compatible with the substrate materials upon which it is applied, including any existing paint or residual adhesive from decals if this is not completely removed, such that the vehicle structure is protected from corrosion and a high quality appearance is maintained for the life of the paint system. The effects of residual adhesive should be assessed by water break test to establish the compatibility of new paint systems.
- 3.2 The condition of any existing paint that is not removed prior to applying the new paint shall be assessed to determine the extent of its remaining design life. Tests for the presence of toxic pigments, e.g. lead, shall be carried out unless clear confirmation of no toxic elements is provided. Tests for cohesion and inter-coat adhesion shall be carried out to determine the friability and cohesive strength of the existing degraded system. Where the remaining design life is considered to be insufficient to guarantee integrity for the service life of the new paint system, the existing paint shall be completely removed.
- 3.3 Preparation of the substrate shall be in accordance with the paint manufacturer's instructions for the appropriate substrate composition. Materials likely to be encountered include steel, aluminium, glass-reinforced polyester resin and glass-reinforced phenolic resin. The existing typical paint systems likely to be encountered include one-part alkyds, solvent based modified alkyds and solvent based two-pack systems with clear polyurethane lacquer finish. In addition, the latest environmentally compliant two-pack paint systems consist of either high solids/low solvent

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finish coats over water-based primers or fully water-based primers and finish coat systems.

- 3.4 The use of body filler materials shall be limited to minor damage repair and indentations and shall not be used to correct bodyside distortion. The total amount of filler distributed over the whole vehicle body shall not exceed 1 kilogram. Where an adequate filling of indentations cannot be achieved within 1 kilogram of body filler the Contractor shall consult the Customer.

Any body filler so used shall be compatible with both the paint system and any existing paint that is not removed.

4. APPLICATION OF PAINT SYSTEM

- 4.1 The paint system selected shall be compatible with the complexity of the paint livery design and shall be capable of accepting livery decals.
- 4.2 The paint system shall be applied under controlled conditions agreed with the paint manufacturer and in accordance with the manufacturer's instructions.
- 4.3 The new paint system shall be free from defects, including (but not limited to) inclusions, brush marks, spray pattern runs, orange peel effects, sagging, solvent bubbling, lines and wrinkles. Application reference panels shall be used for quality control of the applied paint system.
- 4.4 The new paint system shall be adhered securely to the substrate material to at least the standard in Appendix A.1. The Contractor shall provide sufficient test data to show that adhesion is within acceptable limits. Testing shall be carried out on at least 2 vehicles and whenever there is a paint batch change.
- 4.5 The Contractor shall keep an auditable Painting Process Log for each vehicle, a copy of which shall be made available to the Customer on request.

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5. WEATHER RESISTANCE

5.1 The paint system shall provide complete corrosion protection for vehicles operating in UK ambient conditions. This shall include:

- i) temperatures in the range -17°C to +35°C;
- ii) relative humidity between 30% and 100%;
- iii) rain precipitation of up to 60mm/hour;
- iv) hail, sleet, snow and alternate freeze/thaw;
- v) spray from salt water (typically sea water);

Resistance to humidity and resistance to salt spray shall be in accordance with Appendices A.8 and A.9 respectively.

The paint system shall remain free from defects for the duration of its service life, including (but not limited to) surface crazing, blistering, chalking, checking, cracking, peeling, pinholing and underfilm corrosion.

5.2 The paint system shall provide good protection from the effects of UV light with minimal colour change and gloss reduction for the duration of its specified service life. The standards in Appendix A.7 are to be met as a minimum requirement..


6. PHYSICAL PROPERTIES

6.1 The paint system shall be resistant to physical damage from impact, chipping, scratching, abrasion and flexing in accordance with Appendix A.2 to A.6 respectively. The paint system shall also be resistant to the application and removal of adhesive livery decals.

6.2 Minor damage to the paint system shall be easily repairable in accordance with Section 9 of this Specification.

7. CHEMICAL RESISTANCE

7.1 The paint system shall be resistant to the standard processes and cleaning agents approved by Belmond for the exterior of rail vehicles. The typical cleaning agents are listed in Appendix B and the typical frequency of cleaning is given in Section 2.5. The resistance to lower or higher dilution ratios than those recommended, or where concentration of cleaning agent occurs in ponding areas etc. shall be confirmed.

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- 7.2 The paint system shall be resistant to contamination by residues from brake pad friction materials, diesel fuel oils, de-icing fluids and anti-freeze fluids. Such contamination shall be capable of being easily removed by means of the standard processes and cleaning agents.
- 7.3 The paint system shall be resistant to damage caused by iron oxide staining, typically from brake dust.
- 7.4 The Contractor shall make available on request sufficient data to demonstrate the resistance to standard processes, cleaning agents and contamination from the above residues in accordance with Appendices A.10 and A 12.

8. GRAFFITI RESISTANCE

- 8.1 The applied paint system shall be resistant to graffiti, typically marker pens and aerosol sprays.
- 8.2 The paint system shall be formulated to permit easy removal of multiple applications of such graffiti with no adverse effect on the appearance of the underlying paint finish or the degree of corrosion protection afforded to the vehicle structure (see Appendix A.11).
- 8.3 The Contractor shall supply details of the procedure to be followed when removing graffiti and of any chemicals used in the process. The details shall be included in the repair procedure referred to in Section 9. Where possible, chemicals listed in Appendix B should be used. Any alternative chemicals shall be submitted to the Customer for approval.

9. DAMAGE REPAIR

- 9.1 The applied paint system shall permit quick and simple repainting or touching-in areas subject to minor damage of up to 1 square metre without the need for specialist equipment or facilities. Any minor damage repair shall be capable of being carried out during routine examinations with a maximum vehicle downtime of 8 hours.
- 9.2 The Contractor shall supply a procedure to be followed when repairing damaged areas of paintwork, which shall include recommended body filler materials that are compatible with the paint system. The procedure shall also include details for the removal of graffiti.

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- 9.3 The procedure shall specify the minimum facilities and conditions that are necessary to achieve the required standard of repair.
- 9.4 The Contractor shall grant rights for the use of the repair procedure to third parties and offer training in its use.

10. HEALTH AND SAFETY/ENVIRONMENTAL REQUIREMENTS


- 10.1 The paint system and all processes used in its initial application to the vehicle, damage repair and graffiti removal shall comply with all applicable Health and Safety Legislation in force at the date of Contract, and in particular with the PG6/41 Environmental Protection Act (1990), Coating and Re-coating of Rail Vehicles. Details of health and safety information for the paint system and cleaning products, including all COSHH data sheets, shall be made available for each paint product in the complete system.

11. FIRE PERFORMANCE

- 11.1 The paint system shall meet, as a minimum, the fire performance requirements for vehicle exterior surfaces for the relevant vehicle category as laid down in EN 45545 2013 Unless otherwise stated, this shall be taken to be HL 2.

12 INFORMATION TO BE SUPPLIED BY THE CUSTOMER


- 12.1 The Customer will supply the following information to the Contractor:
- The vehicle livery specification and livery diagrams.
 - The required minimum service life of the paint system to be applied.
 - Details of the paint system currently applied to each vehicle (where known).
 - Details of substrate materials (where known).
 - Work location to be made available to the Contractor.
 - Fire performance requirements.

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- Completed Summary Sheet, Appendix C.


13 DELIVERABLES TO BE SUPPLIED BY THE CONTRACTOR

- 13.1 The contractor shall provide a clause by clause commentary on this specification, giving full details of how compliance with the requirements of each clause is to be achieved. Any statement of non-compliance shall be accompanied by an explanation for the non-compliance and full details of the alternative offer.
- 13.2 The Contractor shall supply a unique reference number for the paint system applied for each contract that must be recorded with the Customer and vehicle owner, where they are separate Companies.
- 13.3 The Contractor shall make available to the Customer a copy of the Painting Process Log for each vehicle.
- 13.4 The Contractor shall supply a paint system repair procedure in accordance with Section 9.
- 13.5 The Contractor shall make available health and safety data sheets for the paint system and for all processes used in its initial application to the vehicle, damage repair and graffiti removal.
- 13.6 The Contractor shall make available fire performance information and copies of relevant fire test reports in accordance with the requirements of Section 11.
- 13.7 The Contractor shall supply written guarantee in compliance with this Specification and in compliance with the Customer information submitted under Section 12.
- 13.8 Duplicate set(s) of colour reference panels for each of the livery colours.

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APPENDIX A: MINIMUM PERFORMANCE REQUIREMENTS

	PROPERTY	METHOD OF TEST	SPECIFICATION REQUIREMENT
A.1	Adhesion	BS 3900: Part E6: 1992 Cross-cut test	Classification 1 not to be exceeded.
A.2	Impact Resistance	BS 3900: Part E3: 1991 at 23°C ±(2°C) & at -15°C	No cracking, flaking, wrinkling, inter-coat adhesion failure or detachment from the substrate.
A.3	Chip Resistance	ASTM D 3170-74	Chipping rating of 4A-5B-10C-10D not to be exceeded.
A.4	Scratch Resistance	BS 3900: Part E2: 1992 using a 2 kg weight	No penetration of the paint system.
A.5	Abrasion Resistance	ASTM D 4060-84	Weight loss not to exceed 30 mg.
A.6	Flexibility	BS 3900: Part E1: 1995 6 mm diameter mandrel	No cracking, flaking or detachment from the substrate.
A.7	Resistance to UV Light	ASTM D 4587-86 UV-A for 500 hours	No change in colour (ΔE) greater than 0.45 units and no gloss reduction greater than 10%.
A.8	Resistance to Humidity	BS 3900: Part F2: 1973 -10°C to 40°C	No softening, swelling, blistering or underfilm corrosion
A.9	Resistance to Salt Spray	ASTM B 117 Exposure for 500 hours	No paint system defects; no corrosion or blistering greater than 2 mm from the cut.
A.10	Chemical Resistance	BS 3900: Part G5: 1993 Method 3	Paint system shall suffer no adverse effects after 24 hours exposure to all relevant cleaning agents, fluids and residues.
A.11	Resistance to Graffiti	6 cycles, felt marker pen and aerosol spray paint	No ghosting, colour loss or gloss reduction. No softening, swelling or blistering of the paint system.

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APPENDIX B: BELMOND APPROVED CLEANING AGENTS FOR THE EXTERIOR OF RAIL VEHICLES

PRODUCT NAME	PRINCIPAL USES	CATALOGUE NUMBER	SUPPLIER
Mainline	In vehicle washing plants for the removal of oil & dirt	007/007208, 7209 & 7210	Diversey Transport Ltd Westson Favell Centre Northampton, NN3 8PD. Tel 01604 783505 Fax 01604 783506
Oxiwash	In vehicle washing plants for the removal of brake dust	007/007165	Diversey Transport Ltd Westson Favell Centre Northampton, NN3 8PD. Tel 01604 783505 Fax 01604 783506
Caustic Soda	Neutralising acidic effluent from vehicle washing plants	007/056040	Diversey Transport Ltd Westson Favell Centre Northampton, NN3 8PD. Tel 01604 783505 Fax 01604 783506
DP17	Bodyside and front end washing	007/021835 & 021836	Ambersil Limited Amber Chemical Company Wylds Road Castlefield Industrial Estate Bridgwater, TA6 4DD. Tel 01278 424200 Fax 01278 425644
Thickened Exmover	Hand washing vehicles – for use at depots only	007/019058, 019033 & 019035	Diversey Transport Ltd Westson Favell Centre Northampton, NN3 8PD. Tel 01604 783505 Fax 01604 783506
Exmover Foam	Hand washing vehicles – for use at depots only	007/019033	Diversey Transport Ltd Westson Favell Centre Northampton, NN3 8PD.

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			Tel 01604 783505 Fax 01604 783506
Powaclene	Exterior & interior heavy clean		Forward Chemicals Ltd PO Box 12 Tanhouse Lane Widnes, Cheshire, WA8 0RD

This list is uncontrolled, therefore may not be up to date. Please ensure you check the current status of approved cleaning agents.

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APPENDIX C: SUMMARY OF INFORMATION TO BE SUPPLIED BY CUSTOMER

1. Requirements of the paint system

- 1.1 Vehicle livery colour specifications:
- 1.2 Livery diagram numbers:
- 1.3 Minimum service life for the paint system:
- 1.4 Fire performance requirements:
EN 45545

2. Other information

- 2.1 Substrate materials (where known):
- 2.2 Details of the paint system currently applied (where known):
- 2.3 Work location:

This form may be used as the basis for a Contract.

Signature (for Customer): Date: