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REVISION REGISTER

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SPECIFICATION D&C B344

SPRAYED BITUMINOUS
WATERPROOFING MEMBRANES

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IC-DC-B344

VERSION FOR:
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Edition 1 / Revision 2
July 2014

ROADS AND MARITIME SERVICES
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FOREWORD

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BASE SPECIFICATION

This document is based on Specification RMS B344 Edition 2 Revision 5.
RMS SPECIFICATION D&C B344

SPRAYED BITUMINOUS WATERPROOFING MEMBRANES

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the design, supply and application of a sprayed bituminous waterproofing membrane (SBWM) between the concrete bridge deck and the asphalt wearing surface.

While the wearing surface is not within the scope of this Specification, the selection of the SBWM must be made in conjunction with the wearing surface to be used.

This specification does not cover the requirements for preformed or liquid applied waterproofing membrane systems, which are covered elsewhere in Specification RMS D&C B343.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 (Not Used)

1.2.2 Schedules of HOLD POINTS and Identified Records

The schedules in Annexure B344/C list the HOLD POINTS that must be observed. Refer to Specification RMS D&C Q6 for the definition of HOLD POINTS.

The records listed in Annexure B344/C are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

1.2.3 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure B344/D and must be implemented.

In all cases where this Specification refers to the manufacturer’s recommendations, these must be included in the PROJECT QUALITY PLAN.

1.2.4 Frequency of Testing

Nominate in Inspection and Test Plan your proposed frequency of testing to verify conformity of the item, which must not be less than the frequency specified in Annexure B344/L. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of RMS D&C Q6.
1.2.5 Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure B344/M:

1.3 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:-

**Combined System**: A combination of sprayed bituminous waterproofing membrane (SBWM) and a wearing surface in accordance with Annexure B344/E. The component of one system cannot be substituted with that of another.

**Primer**: A bituminous material of low viscosity and low surface tension used without aggregate, to penetrate any plastic shrinkage cracks in the existing concrete bridge deck surface and promote adhesion with the membrane.

**Sprayed bituminous waterproofing membrane (SBWM)**: A seal consisting of polymer modified binder and aggregate, hot-sprayed with a mechanical sprayer, designed and applied at an application rate midway between a sprayed seal and a SAM seal.

**Sprayed seal**: A thin layer of conventional bitumen sprayed onto the primed concrete deck with a layer of aggregate incorporated and which is impervious to water.

**Strain alleviating membrane (SAM) seal**: A sprayed seal, with the binder containing a relatively high concentration of polymer modifier. It is used to absorb strains that occur in the concrete deck layer and thereby reduce reflection cracking.

1.4 SAFETY AND ENVIRONMENTAL PROTECTION

1.4.1 Work Health and Safety

Implement Work Health and Safety measures, including preparation of Safe Work Method Statements, in accordance with Specification RMS D&C G22.

1.4.2 Environmental Protection

Implement appropriate environmental control measures in accordance with Specifications RMS D&C G36 and D&C G38.

2 MATERIAL REQUIREMENTS

2.1 BITUMINOUS MATERIALS

2.1.1 Primer

The primer must consist of bitumen and one or more materials, which when mixed together in accordance with the manufacturer’s recommendations form a homogeneous mixture. The component materials must be stable prior to mixing.
The primer must cure and harden within one hour of application unless accepted otherwise.

The properties of the primer must either conform to the requirements for refinery or field cutback bitumen as set out in Specification RMS D&C 3261, or, for a proprietary product, the requirements set out in the manufacturer's specification.

2.1.2 Binder

The binder must be of the grade specified in the Design Documentation and conforming to Specification RMS D&C 3252.

2.2 AGGREGATE PRECOATING AGENT AND BITUMEN ADHESION AGENT

Aggregate precoating agents must conform to Specification RMS D&C 3268.

Bitumen adhesion agents must conform to Specification RMS D&C 3269.

2.3 OILS FOR REDUCING BINDER VISCOSITY

The oils for reducing the viscosity of bitumen must conform to AS 3568.

2.4 AGGREGATE

Aggregate must conform to Specification RMS D&C 3151.

2.5 SAMPLING AND TESTING OF MATERIALS

Sample and test materials in accordance with the relevant material requirements specified in Clause 2. Testing frequency must comply with Annexure B344/L.

3 NOMINATED MATERIALS AND DESIGN OF SBWM

The combined system of waterproofing membrane and wearing surface must be in accordance with that nominated in the Design Documentation.

Design the binder application rate as the mean of the value obtained for a SAM seal, and that obtained for a sprayed seal. This binder application rate will be termed the “nominated binder application rate”.

Design the aggregate spread rate of SBWM as a SAM seal. This aggregate spread rate will be termed the “nominated aggregate spread rate”.

Ed 1 / Rev 2
HOLD POINT

Process Held: Commencement of installation of SBWM

Submission Details: Proposed design of SBWM together with certification for the nominated materials and design verification documentation for the SBWM at least seven days prior to the commencement of sealing.

Release of Hold Point: The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point.

4 PRECOATING OF AGGREGATE

Apply the aggregate precoating agent to the aggregate in a manner and at a rate which will provide a complete, light, uniform, effective cover of all aggregate particles at the time of spreading.

Do not carry out precoating of the aggregate when rain is imminent. If aggregate has been precoated and rain appears imminent, cover the aggregate adequately to prevent the precoating material being washed from the aggregate particles.

Take precautions, such as covering stockpiles, to prevent settlement of dust, penetration of moisture or drying out of the precoating agent on the stockpiled aggregate.

5 APPLICATION

5.1 GENERAL

Submit, as part of the PROJECT QUALITY PLAN, details of the plant and equipment, methods to be used for the work and the spraying temperatures recommended by the manufacturer(s) of the binder and primer.

Give the Project Verifier seven days notice of your intention to commenced spraying the binder and primer.

All materials used in the Project Works must be from the batches represented by the submitted certification.

Plan your work such that the time elapsed between the application of the SBWM and the subsequent asphalt is not less than 14 days or more than 90 days.

5.2 PREPARATION OF SURFACES

Clean and prepare all surfaces to be overlaid strictly in accordance with the relevant specifications or, for a proprietary product, the manufacturer's specification. Remove all loose materials on the bridge deck using a suction broom.

The surface must be dry and free of foreign material, including oils or diesel spills, at the time of spraying.
5.3 **PROTECTION OF SURFACES**

Take all necessary precautions to prevent the primer, binder, cover aggregate or other material used in the Project Works from entering or adhering to gratings, kerbs, expansion joints and associated concrete surfaces and other road fixtures.

Immediately after application of the SBWM, clean off or remove any excess material and leave the bridge in a satisfactory condition.

5.4 **CONCRETE TEMPERATURE AND WEATHER CONDITIONS**

Measure and record concrete (top surface) temperatures at regular intervals during the course of the work in accordance with Specification RMS D&C R106 or RMS D&C R107.

The minimum concrete temperature for spraying primers and binders must be in accordance with RMS D&C R106 or RMS D&C R107 or, for a proprietary product, the manufacturer's specification.

Do not spray while concrete surface is wet, when rain appears imminent, or during strong winds or dusty conditions. Do not spray the binder where temperature is likely to fall below 15°C within 8 hours of completing the SBWM.

5.5 **APPLICATION OF PRIMER AND BINDER**

Unless specified otherwise, the application of the primer must comply with the corresponding requirements of RMS D&C R106, while the application of the SBWM must comply with those of RMS D&C R107 or the manufacturer’s specification.

Application of the primer and binder for the SBWM must be in accordance with RMS D&C R106 or RMS D&C R107 or, for a proprietary product, the manufacturer's specification.

Apply the primer to the deck at the rate of 0.04 – 0.06 L/m² residual bitumen measured at 15°C.

5.6 **APPLICATION AND INCORPORATION OF AGGREGATE**

Apply the aggregate where required after spraying of the binder has commenced, and be completed within the time limit specified in RMS D&C R107.

Detail the method to determine the actual aggregate spread rate in the PROJECT QUALITY PLAN.

When the aggregate has been evenly spread and embedded in the binder, remove any remaining loose particles of aggregate. State in the PROJECT QUALITY PLAN the method and timing of the removal of loose aggregate.

5.7 **WORK RECORDS**

Submit work records on the appropriate RMS forms for priming and SBWM as specified in RMS D&C R106 or RMS D&C R107, as applicable.
6 GUARANTEES OR WARRANTIES

Provide a guarantee or warranty on the serviceability of the membrane for a minimum period of five years from the date of installation. The guarantee or warranty must provide that all defects to the membrane or to the wearing surface resulting from membrane defects within this period are rectified by you at no cost to RMS.

Transfer any guarantees or warranties to RMS.
ANNEXURES B344/A TO B344/B – (NOT USED)

ANNEXURE B344/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.2.

C1 SCHEDULE OF HOLD POINTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Submission of proposed design of SBWM and certification of the nominated materials</td>
</tr>
</tbody>
</table>

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>Materials test results</td>
</tr>
<tr>
<td>3</td>
<td>Design verification documentation</td>
</tr>
<tr>
<td>5</td>
<td>Work records</td>
</tr>
</tbody>
</table>
ANNEXURE B344/D – PLANNING DOCUMENTS

Refer to Clause 1.2.3.

Supply the following information as part of the PROJECT QUALITY PLAN:

(a) Details of the combined system to be used in the Project Works; refer Annexure B344/E;

(b) Primer penetration of concrete surface including compatibility of nominated materials with any concrete curing compound or other surface treatment of the concrete;

(c) Test results for all nominated materials, including stripping (Test Method RMS T230) and initial adhesion (Test Method RMS T238) for the combination of nominated materials;

(d) Any identified hazards or risks, and your proposed Safe Work Method Statement (Clause 1.4);

(e) The following details for all nominated materials (Clause 3):
   (i) Aggregate - source, geological type, particle size distribution;
   (ii) Precoating agent and bitumen adhesion agent - types and proportions;
   (iii) Primer – source and percentage of residual bitumen;
   (iv) Polymer modified binder - refinery source, class and grade;
   (v) Cutter oil - source and type;

(f) Nominated application rates (Clause 3);

(g) Details of the plant and equipment and methods to be used for application of SBWM and the spraying temperatures recommended by the manufacturer of the bituminous material (Clause 5.1);

(h) Removal of loose aggregate (Clause 5.6);

(i) Method to determine the actual aggregate spread rate (Clause 5.6).
## ANNEXURE B344/E – COMBINED SYSTEMS

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<th>ID</th>
<th>System</th>
<th>Details</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SBWM/DGA</td>
<td>SBWM with 10 mm cover aggregate and 70 mm DGA. Total thickness: 75 mm.</td>
<td>High traffic areas where SBWM/DGA is practical and economic and DGA or concrete wearing surface on the approaches.</td>
</tr>
<tr>
<td>II</td>
<td>SBWM/DGA/SMA</td>
<td>SBWM with 10 mm cover aggregate, nominal 35 mm DGA and 35mm SMA. Total thickness: 75 mm.</td>
<td>Where SMA is used on approaches and a SBWM is practical.</td>
</tr>
<tr>
<td>III</td>
<td>SBWM/DGA/OGA</td>
<td>SBWM with 10 mm cover aggregate, nominal 35 mm DGA and 35 mm OGA. Total thickness: 75 mm.</td>
<td>Where adequate drainage system is provided, and a SBWM is practical.</td>
</tr>
</tbody>
</table>
| IV | SBWM double/double seal | Double/double sprayed seal.  
- First layer SBWM with 14 mm cover aggregate.  
- Second layer: bitumen sprayed seal with 7 mm cover aggregate. Both layers must be applied on the same day. Total thickness: 14 mm. (Deck joints must be set 15 mm high to accommodate the seals). | Where asphalt is uneconomic to construct or maintain. A 7 mm SBWM seal can be used to maintain the system after 7-10 years. |

### Legend

- **SBWM** – Sprayed Bituminous Waterproofing Membrane
- **DGA** - Dense graded asphalt
- **SMA** – Stone Mastic Asphalt
- **OGA** - Open graded asphalt
### Annexure B344/L – Minimum Frequency of Testing

Refer to Clause 1.2.4.

<table>
<thead>
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<th>Clause</th>
<th>Material *</th>
<th>Specification</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>Primer</td>
<td>RMS D&amp;C 3261 or manufacturer’s specification</td>
<td>One per delivery</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Binder: Polymer Modified Binder PMB)</td>
<td>RMS D&amp;C 3252</td>
<td>One per delivery</td>
</tr>
<tr>
<td>2.2</td>
<td>Precoating Agent</td>
<td>RMS D&amp;C 3268</td>
<td>One per delivery</td>
</tr>
<tr>
<td>2.2</td>
<td>Bitumen Adhesion Agent</td>
<td>RMS D&amp;C 3269</td>
<td>One per delivery</td>
</tr>
<tr>
<td>2.3</td>
<td>Oils for reducing viscosity of bitumen and PMB</td>
<td>AS 3568</td>
<td>One per delivery</td>
</tr>
<tr>
<td>2.4</td>
<td>Aggregate</td>
<td>RMS D&amp;C 3151 RMS T230 RMS T238</td>
<td>One sample for Lots up to 250 m³, and one for each additional 250 m³</td>
</tr>
</tbody>
</table>

*Note: Proprietary components must be sampled and tested to satisfy the manufacturer’s minimum production control requirements for the deed.*
ANNEXURE B344/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

RMS Specifications

RMS D&C G22  Work Health and Safety (Construction Works)
RMS D&C G36  Environmental Protection
RMS D&C G38  Soil and Water Management
RMS D&C Q6   Quality Management System (Type 6)
RMS D&C R106 Sprayed Bituminous Surfacing (with Cutback Bitumen)
RMS D&C R107 Sprayed Bituminous Surfacing (with Polymer Modified Binder)
RMS D&C 3151 Cover Aggregate for Sprayed Bituminous Surfacing
RMS D&C 3252 Polymer Modified Binder for Pavements
RMS D&C 3261 Cutback Bitumen
RMS D&C 3268 Aggregate Precoating Agent (for Polymer Modified Binder)
RMS D&C 3269 Bitumen Adhesion Agent (for Polymer Modified Binder)

RMS Test Methods

RMS T230  Resistance to Stripping of Cover Aggregates and Binders
RMS T238  Initial Adhesion of Cover Aggregates and Binders

Australian Standards

AS 3568  Oils for reducing the viscosity of residual bitumen for pavements