3.12 PREMIX BITUMINOUS SEAL COAT (MANUAL METHOD)

3.12.1 Description

3.12.1.1 General

This work shall consist of a premix bituminous seal coat applied to newly laid binder course of bituminous carpeting, or a prepared and primed granular base course, or existing bituminous surface in accordance with these Specifications. The thickness of the premix bituminous seal coat shall be 7 mm, 12 mm or 15 mm as directed and shall be to the lines, levels, grades, dimensions and cross sections shown on the Drawings or as required by the Engineer.

The provisions of Section 3.5, “General Requirements for Bituminous Surfacing” shall form a part of these Specifications except that the requirements for plant mixing and laying by paving machine may be relaxed provided the Contractor proposes and demonstrates effective alternative methods to the full satisfaction of the Engineer. Such methods shall take account of the total quantity of material to be mixed and laid within the stipulated programme. Any alternative methods shall only be employed after receipt of written approval from the Engineer. Such approval may be withdrawn at any time if the work is found to be unsatisfactory.

3.12.1.2 Composition of the Mixture

The mixture shall consist of aggregate and sand, coated with bitumen with the materials complying with Section 3.5.2 of these specifications. The Contractor shall meet the requirements of the job mix formula in section 3.5.1.3 and the tolerances in Section 3.5.1.4.

The material shall conform to Table 3.12-1 below, unless otherwise directed by the Engineer in writing.

Table 3.12-1

<table>
<thead>
<tr>
<th>Mix classification</th>
<th>1 Seal Coat</th>
<th>2 Seal Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>7</td>
<td>12 or 15</td>
</tr>
<tr>
<td>Compacted Thickness (mm)</td>
<td>Total % by weight passing</td>
<td>100</td>
</tr>
<tr>
<td>Sieve Size (mm)</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>6.3</td>
<td>100</td>
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</tr>
<tr>
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<td>80-100</td>
<td>75-95</td>
</tr>
<tr>
<td>2.4</td>
<td>70-95</td>
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<td>20-50</td>
<td>5-15</td>
</tr>
<tr>
<td>0.075</td>
<td>5-15</td>
<td>2-10</td>
</tr>
</tbody>
</table>

3.12.2 Materials

3.12.2.1 General

The materials shall conform to Section 3.5.2 of these Specifications with the additional requirements noted below.
3.12.2.2 Bituminous Materials

These materials shall conform to the requirements of Section 3.4. The bituminous material shall be 60/70 or 80/100 penetration grade.

3.12.2.3 Mineral Aggregate

Aggregates shall consist of 6.3mm or 10mm down graded pea gravel free from any organic matter, clay and any other objectionable matter.

Where required to achieve the specified grading the aggregate shall be mixed with natural sand. Sand shall be non-plastic, clean and free from any deleterious substances. The minimum FM of sand for the sealing premix shall be between 2.00 to 2.50 and that of sand to be spread over the seal coat as blotting material shall be between 0.80 to 1.00.

The mix of the aggregates and sand combined shall comply with the following grading given in Table 3.12-1.

3.12.2.4 Mixture

The Contractor shall carry out regular checks at frequency to be determined by the Engineer on the composition of the mixed material and shall submit results to the Engineer within 3 days of sampling.

3.12.3 Construction Methods

3.12.3.1 General

Construction methods shall conform to the general requirements of Section 3.5.3 of these Specifications subject to the following modifications.

Following approval of the mix formula the contractor shall undertake short trial sections of approximately 10 metres length, prior to commencing contract surfacing. These trials are to demonstrate that the contractor and the laying staff understand, and can apply the specification correctly to produce the quality of work specified on a consistent basis. The trials will also be used to fine tune the mix design if required.

If the trial works are suitable, they may be accepted in the contract works. If the trial work has to be rejected, they can be permitted to remain in the works until replacement near the end of the contract, so that unspecified work can be monitored and used to demonstrate to other contractors and supervision staff the defects that will manifest themselves if work is carried out using unspecified materials, workmanship or methodology.

Once the Contractor has demonstrated an acceptable procedure he shall submit in writing his full method statement for the Engineer’s approval. No surfacing works will be permitted until the Engineer’s approval has been granted, in writing, and once approved the method shall not be varied in any way without reference to, and approval of the Engineer.

The Contractor shall furnish a thermometer at each mixing unit to ensure that temperature of bitumen, mineral aggregates and bituminous mixture shall be within the specified ranges stipulated in 3.12.3.2 through 3.12.3.5.
3.12.3.2 Preparation of Bituminous Material

Bitumen shall be heated in a tar boiler to a temperature between 121°C and 163°C. Locally produced, wood fired boilers are satisfactory, and at the ambient temperatures experienced in Bangladesh the 80/100 penetration grade bitumen required under the specification can be poured (albeit slowly) into the tar boiler. When the boiler is approximately 30% full the fire box is filled with wood and the wood ignited. In practice the boilers are generally kept over 50% full during operation by allowing up to two drums of bitumen to drain down through a manhole, on top of the boiler, into the main heating tank.

The temperature control at the boiler is critical to the success of this methodology. When the thermometer within the mass of bitumen in the main tank reaches 150°C the firebox must be emptied or the fire extinguished. The residual heat within the tar boiler will continue to heat the bitumen to the required maximum temperature of 163°C. When the temperature is falling and reaches 155°C the fire box should be refilled with wood and re-ignited as the temperature will soon fall below 150°C. The operation is repeated as the temperature again regains 150°C. With experience the operator can soon judge how much firewood is required to achieve and maintain the specified temperatures.

3.12.3.3 Preparation of Mineral Aggregate

Once the aggregates and the job mix has been approved, the Contractor shall construct gauging boxes to the required size which, when filled and struck off level, deliver the desired volume for that size of stone.

The pea gravel and sand are batched into a rectangular steel pan with handles at each corner and heated on top of a metal frame under which heating is provided by firewood and sawdust. The mixture is continually raked to ensure thorough mixing and even heating. The temperature of the mixture must reach 163°C after which the pan shall be transferred to an unheated frame where raking should continue until the mixture temperature has reduced to the maximum temperature permitted in the specification (163°C).

3.12.3.4 Preparation of Premix Seal Coat

The heated bitumen is drawn off from the tar boiler, decanted into gauge tins and added to the aggregate in the pan on the unheated frame in the proportion of 1.0kg of bitumen to 0.01m³ of aggregate mixture, which shall be laid on 1.0m² of road surface for 7mm thickness seal coat. The proportions will be increased to 1.36kg of bitumen to 0.016m³ of aggregate mixture on 1.0m² of road surface for 12 mm thickness seal coat. As the two ingredients are at approximately the same temperature there is no risk of fire, overheating or the clouds of black smoke (indicating hot bitumen being applied to very hot aggregates) associated with other manual methods. The mixing is carried out on the unheated frame and, when satisfactorily completed, the pan is carried to the adjacent work head for placing.

The mixture shall after mixing be at a temperature within the limits of 135°C and 163°C. The Contractor shall record and submit the measured temperatures for the Engineer’s approval.

3.12.3.5 Spreading and Compaction

The mixed bituminous seal coat shall be placed and spread over the granular base course which has been primed or bituminous carpeting to a uniform thickness which shall be a minimum of 25% greater than the specified compacted thickness, and
immediately compacted with a power driven road roller to the satisfaction of the Engineer.

Static tandem steel wheel rollers will require trials to assess the number of passes to achieve full compaction. Compaction is generally achieved when all roller marks have been removed. Rollers shall not be allowed to stand on newly laid material that may be deformed thereby.

The mixture shall be compacted as soon after being placed as the material will support the roller without undue displacement or cracking and sufficient compaction plant should be deployed so that the required degree of compaction is achieved before the mat has cooled to a temperature of 107°C.

To avoid traffic disruption, the spreading and compaction on sections of existing bituminous surface is often carried out over half the road width only.

Unless the Engineer directs otherwise the seal coat where specified shall be applied immediately after laying of the bituminous carpeting and the seal coat and bituminous carpeting shall be rolled together. The combined thickness of the two layers shall not be less than the sum of the two specified layer thickness.

### 3.12.3.6 Joints

The work shall be organised so that transverse joints are kept to a minimum and, where practical, only occur at specified positions (i.e. bridges etc.). All transverse joints are to be cut back to well compacted full depth material to produce a straight vertical joint which is to be painted with bitumen before laying of new material.

To attain a strong and even connection in the longitudinal direction, joints shall be pre-heated in front of laying the adjacent bituminous mix. Alternatively, if approved by the Engineer, the joint can be cut back and painted with bitumen.

### 3.12.3.7 Protection of the Pavement

Sections of the newly finished work shall be protected from traffic of any kind until the mixture has cooled to approximately ambient air temperature. Traffic shall not normally be permitted on the newly laid surface less than 6 hours after completion of the pavement, except with the approval of the Engineer.

### 3.12.3.8 Pavement Samples

If the seal coat is placed on to the carpet course specified in Section 3.11 the Contractor shall, after final rolling and before opening the surface to traffic, cut samples from the finished work for testing. Samples for the full depth of the course and seal shall be cores with diameters of 100 or 150 mm as directed, and cut by an approved coring machine, from the locations directed by the Engineer. At least one sample for density and thickness measurement shall be taken for each 50 m of completed surfacing.

When the seal coat is placed over an existing bituminous surfacing samples for analysis and other tests shall be taken from the surfacing when the Engineer so directs.

Where samples have been taken from the surface course, fresh material shall be placed, thoroughly compacted and finished to the satisfaction of the Engineer.

### 3.12.3.9 Surface Texture
The surface finish of the finished surfacing shall be close and tight.

3.12.4 Measurement

The quantity of bituminous seal coat measured for payment shall be the number of square metres completed and accepted to the thickness shown on the Drawings or as directed by the Engineer. Bitumen used in the mix shall be deemed to be included and shall not be measured separately irrespective of its quantity. No price adjustment shall be made if the quantity of bitumen used increases or decreases due to a change in the job mix formula during the works.

3.12.5 Payment

The quantities measured as provided above, shall be paid for at the Contract unit rates. The prices and payments shall be full compensation for furnishing and placing all materials including all labour, equipment, tools, trials, preparation of job-mix formulas, testing, making good test holes, and incidentals necessary to complete the work.

Pay items shall be:

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<tr>
<th>Code</th>
<th>Description</th>
<th>Unit</th>
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</thead>
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<td>3/12/1</td>
<td>7mm Compacted Premix Bituminous Seal Coat</td>
<td>Square Metre</td>
</tr>
<tr>
<td>3/12/2</td>
<td>12mm Compacted Premix Bituminous Seal Coat</td>
<td>Square Metre</td>
</tr>
<tr>
<td>3/12/3</td>
<td>15mm Compacted Premix Bituminous Seal Coat</td>
<td>Square Metre</td>
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