3.11 PREMIX BITUMINOUS CARPETING (MANUAL METHOD)

3.11.1 Description

3.11.1.1 General

This work shall consist of a surfacing of bituminous material, constructed on a prepared base in accordance with these Specifications, 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 Such approval may be withdrawn at any time if the work is found to be unsatisfactory.

Bituminous carpeting shall consist of one or two layers of binder course of the total thickness shown on the drawings or as directed by the Engineer. The upper layer shall be given a premixed seal coat as specified in section 3.12 to provide a close textured surface finish.

3.11.1.2 General Composition of the Mixture

The mixture shall consist of mineral aggregate and filler if needed, coated with bitumen, with the materials complying with Section 3.5.2 of these Specifications.

When the total thickness of bituminous base (binder) course exceeds 50 mm, the material may be laid in two layers if so directed by the Engineer. The material shall conform to the mix classification 1 in Table 3.11-1.

The selected job-mixes shall conform to Table 3.11-1, unless with the specific approval of the Engineer.

Table 3.11-1

<table>
<thead>
<tr>
<th>Mix classification Course Thickness (mm)</th>
<th>1 Base (Binder) 25</th>
<th>2 Base (Binder) 38 or 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size (mm)</td>
<td>Total % by weight passing</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
<td>75-100</td>
</tr>
<tr>
<td>12.5</td>
<td>75-100</td>
<td>60-80</td>
</tr>
<tr>
<td>10</td>
<td>60-80</td>
<td>-</td>
</tr>
<tr>
<td>5.0</td>
<td>40-60</td>
<td>40-60</td>
</tr>
<tr>
<td>2.4</td>
<td>20-35</td>
<td>20-38</td>
</tr>
<tr>
<td>0.6</td>
<td>10-20</td>
<td>6-18</td>
</tr>
<tr>
<td>0.075</td>
<td>2-8</td>
<td>2-8</td>
</tr>
</tbody>
</table>

Bitumen Content % by weight of total mixture. 5.5% ± 0.3% (5.2% - 5.8%) 5.2% ± 0.3% (4.9% - 5.5%)
The Contractor shall meet the requirements of the job-mix formula and the allowable tolerances in Section 3.5.

3.11.2 Materials

3.11.2.1 General

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

3.11.2.2 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.

3.11.2.3 Coarse Mineral Aggregate

The provision of Section 3.5.2.1 shall apply.

3.11.2.4 Fine Mineral Aggregate and Mineral Filler

The provision of Sections 3.5.2.2 and 3.5.2.3 shall apply.

3.11.2.5 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.

3.11.3 Construction Methods

3.11.3.1 General

A prime coat shall be applied to the surface of the granular base material or a tack coat to an existing bituminous surface in accordance with Section 3.6 or 3.7 before spreading the bituminous carpet.

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 lay trial sections of surfacing 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 works 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 should 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 3.11.3.2 through 3.11.3.5.

3.11.3.2 Preparation of Bituminous Material

Bitumen shall be heated to a temperature between 121°C and 163°C. Locally produced, wood fired boilers are satisfactory for this purpose, however, the boiler should be approximately 30% full before the firebox 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.

3.11.3.3 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 of each size of aggregate to provide the optimum gradation, for each batch.

The stone is 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 aggregates are continually raked to ensure thorough mixing and even heating. The temperature of the aggregate must reach above 163°C after which the pan shall be transferred to an unheated frame where raking should continue until the aggregate temperature has reduced to the maximum mixing temperature permitted in the specification (163°C).

3.11.3.4 Preparation of Mixture

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. 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 records.
3.11.3.5 Spreading and Compaction

Unless the bituminous premix is laid directly onto a clean prime coat, a tack coat shall be applied in accordance with Section 3.7, to the underlying surface prior to spreading the binder course.

The depth of the finished surfacing, and the density of the material after compaction, is controlled by using mild steel angles as side shutters (32 × 32 mm for a finished 25 mm surfacing, 50 × 50 mm for a finished 38 mm thick surfacing, and 65 × 65 mm for a finished 50 mm surfacing) and marking on the prime coat with chalk the area that each pan of mixed material should cover. The cross-fall or super elevation is controlled in a similar way using 32 mm rods for 25 mm surfacing and 50 × 6 mm steel plate for 38 mm thick surfacing, and 65 × 6 mm steel plate for 50 mm surfacing at intermediate points between the edge of the road and the crown of the road.

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.

If the Contractor is using a 3.5 ton vibrating roller the initial pass shall be with NO vibration. The side and intermediate shutters are then moved to their next location while the roller, with vibration ON, completes the compaction process. Trials will be required to assess the number of passes to achieve full compaction for each type of roller and is relative to the thickness of the surfacing provided and the ambient temperature. 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. Sections of newly laid base course and binder course shall be kept clean prior to laying the surface course and no traffic except in connection with laying the surface course shall be permitted on the prepared base course or binder course.

To avoid traffic disruption, the spreading and compaction is often carried out over half the road width only.

For regulation courses the thickness of a compacted layer shall not be less than twice the maximum grain size.

Unless the Engineer directs otherwise the seal coat specified in section 3.12 shall be applied immediately after laying of the carpet course and the seal coat and carpet course shall be rolled together. The combined thickness of the two layers shall not be less than the sum of the two specified layer thickness.

3.11.3.6 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.

3.11.3.7 Edge Treatment
On 38 mm Bituminous Carpeting works the mix at the edge of the road may be open textured after compaction and chippings can be displaced by traffic during the initial maturing period (four to eight weeks). This will be overcome by placing a narrow strip of pea-gravel bitumen seal (approximately 75 mm wide) against the shoulder side steel angle prior to the placing of the Bituminous Carpeting. This, when compacted along with the Bituminous Carpeting, will provide a dense, true edge to the road and will minimise ragged edges.

3.11.3.8 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.

3.11.3.9 Pavement Samples

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 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.

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.

3.11.3.10 Surface Texture

The surface finish of the finished surfacing shall be close and tight.

3.11.4 Measurement

The quantity of bituminous carpeting measured for payment shall be the number of cubic metres accepted and completed surfacing to the width and thickness shown on the Drawings. Should the widths and/or thickness of the surfacing be less than indicated on the Drawings, the quantities measured for payment will be based on the actual widths and/or thickness.

The bituminous carpeting shall be measured as the net dimensions of the top surface of each course and the Contractor will make allowance in his rate for additional material used for forming sloping edges and over spill.

3.11.5 Payment

The quantities measured as provided above, shall be paid for at the Contract unit price 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. Tack coat shall not be paid for separately except where specifically provided for in the Contract Documents.

Pay items shall be:

3/11/1 Premix Bituminous Carpeting Cubic Metre