10.12 Spray Rate of Bitumen

10.12.1 General

When carrying out surface dressing work using a motorised bitumen distributor, it is necessary to measure the rate of spread of the bitumen. Too low a rate of spray will result in chippings not adhering to the surface and too high a rate of spray will lead to ‘fattening up’ of the surface in addition to being uneconomic.

There are two basic types of bitumen distributor, those which supply bitumen at a constant pressure to the spray bar and those in which the pressure on the spray bar is directly coupled to the vehicle’s engine speed.

The former type is generally to the preferred as changes in the bitumen spray rate may be made simply by adjusting the speed of the vehicle, the higher the speed the lower the rate of spray. With the second type the distributor, it is only possible to change the rate of spray by engaging a different gear, the spray rate can, therefore, only be adjusted in steps, increasing the speed of the vehicle purely increases the pressure on the bar and the spray rate remains virtually constant.

It should be noted that the rate of spray will be seriously affected by the grade of bitumen used and the temperature of the bitumen. The specified temperature for the particular grade of bitumen in use must be strictly maintained. The jets on the spray bar of a distributor are designed to operate at a given viscosity and, hence, harder grades of bitumen (lower penetrations) must be heated to higher temperatures than softer grades, or cut-back bitumens. Some bitumen emulsions may be sprayed without heating.

The tray test is a simply field test which measures the rate of spray and allows adjustments in the speed of the vehicle (or the gears) to be made for subsequent runs. The apparatus consists simply of a number of aluminium trays, 200 mm. square and about 5 mm. deep. A balance is required for weighing the trays.

Although the tray test will measure the rate of spray from a particular part of the spray bar, it cannot account for variations along the bar. It is essential that all the jets are fully cleaned and operating freely and that the bar is level and at the correct height.

10.12.2 Test Procedure

The clean dry trays are numbered on the underside and weighted. Usually 5 trays are used for each test and to allow time for cleaning at least 10, and preferably 15 trays, are required for quality control work.

The trays are then placed on the prepared road surface in a random pattern in front of the distributor lorry. The trays should be spaced out along the whole length to be sprayed and should cover the full width of the spray bar, excepting the very edges where there is no overlap on the jets. Obviously the trays must not be placed in the path of the distributor wheels, as the distributor is normally only moving at walking pace the position of the trays may be adjusted as the lorry approaches.

Immediately after spraying the trays should be carefully lifted from the surface with a pair of tongs or pliers and re-weighed.

To enable the trays to be removed, it is usually necessary to spread a few chippings on to the surface of the bitumen to allow the operative to reach the tray without
damaging the surface. Immediately after removing the tray, the area of road under the tray should be covered in not bitumen from a bitumen pouring can.

After use, the trays should be thoroughly cleaned, using a solvent such as diesel, kerosine or petrol, this operation should be carried out in an open space away from fires or other sources of heat. Any damaged trays should be repaired and checked for dimensional accuracy. The trays should be re-weighed each time, before use.

If it is required to measure the rate of spread of chippings laid on the bitumen, the same procedure may be used but larger sized trays will give more accurate results. A few chippings should be spread in the bitumen under the trays to prevent the bitumen contaminating the underside of the trays.

### 10.12.3 Calculation

Weight of bitumen in tray, \( W = (\text{Weight of tray} + \text{Bitumen}) - (\text{Weight of tray}) \) grams

Area of tray ,\( A = \frac{\text{Length}}{1000} \times \frac{\text{breadth}}{1000} \) sq. meter

Spray rate \( = \frac{W}{A} \) grams / sq. metre

\( \frac{W}{1000A} \) Kg / sq. metre = \( \frac{W}{1000A} \) litres / sq. metre

Where \( b \) is density of bitumen at road temperature

(Normally taken as 1.0)

Typical results are shown as Form 10.12.1.

### 10.12.4 Reporting of Results

The individual results should be reported to the nearest 0.1 kg/sq.metre.

The speed of the distributor, the grade of bitumen, the temperature of spraying and the detailed position of the test should be given.
### Form 10.12.1

**Spray Rate of Bitumen**

**Contract:** Dhaka - Aricha Road  
**Date of Test:** 10/18/79

**Location:** From 12th Mile + 825 ft to 125th Mile + 1025 ft

<table>
<thead>
<tr>
<th>Tray No.</th>
<th>Weight of Tray and Bitumen (grams)</th>
<th>Weight of Tray (grams)</th>
<th>Weight of Bitumen (grams)</th>
<th>Area of Tray (m²)</th>
<th>Spray Rate (Litres/m²)</th>
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<tr>
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<td>64.1</td>
<td>0.04</td>
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<td>56.8</td>
<td>*</td>
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<tr>
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<td>69.2</td>
<td>*</td>
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<tr>
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<tr>
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<td>127.5</td>
<td>64.3</td>
<td>63.2</td>
<td>*</td>
<td>1.6</td>
</tr>
</tbody>
</table>

**Average:** 1.5 l/m²

**Distributor Speed:** 1.6 m.p.h  
**Bitumen Grade:** 80/100  
**Temperature:** °C