

# Asphalt Paving Speed

pavement work tips — no. 31

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## INTRODUCTION

An important element in achieving smooth riding asphalt pavements is maintaining steady continuous paving. General guidance on smooth paver operation is provided in Work Tip No 3.

This Work Tip provides a guide to calculation of paver speed and roller capacity to enable matching of:

- Asphalt plant production rates to average paver speed so that the paver can be kept moving steadily forward, averaging out minor variations in arrival of delivery trucks.
- Paving speed to roller capacity so that the paver forward speed (and rate of supply) does not exceed the capacity of rollers to provide effective compaction, or alternatively to determine the number of rollers required to achieve compaction for a given output.

## PAVER SPEED

The general formula for calculating paver forward speed for a given rate of delivery of asphalt is:

$$P = \frac{D \times 1000}{60 \times w \times t \times d}$$

Where:

$P$  = Paver forward speed (metres/minute)

$D$  = Delivery rate (tonnes/hour)

$w$  = width of spread (metres)

$t$  = compacted thickness (mm)

$d$  = compacted density of asphalt ( $t/m^3$ ).

Alternatively, the rate of delivery to match a particular paver forward speed can be calculated from:

$$D = \frac{P \times w \times t \times d \times 60}{1000}$$

The above formulae can be used to develop tables or charts for typical paving widths.

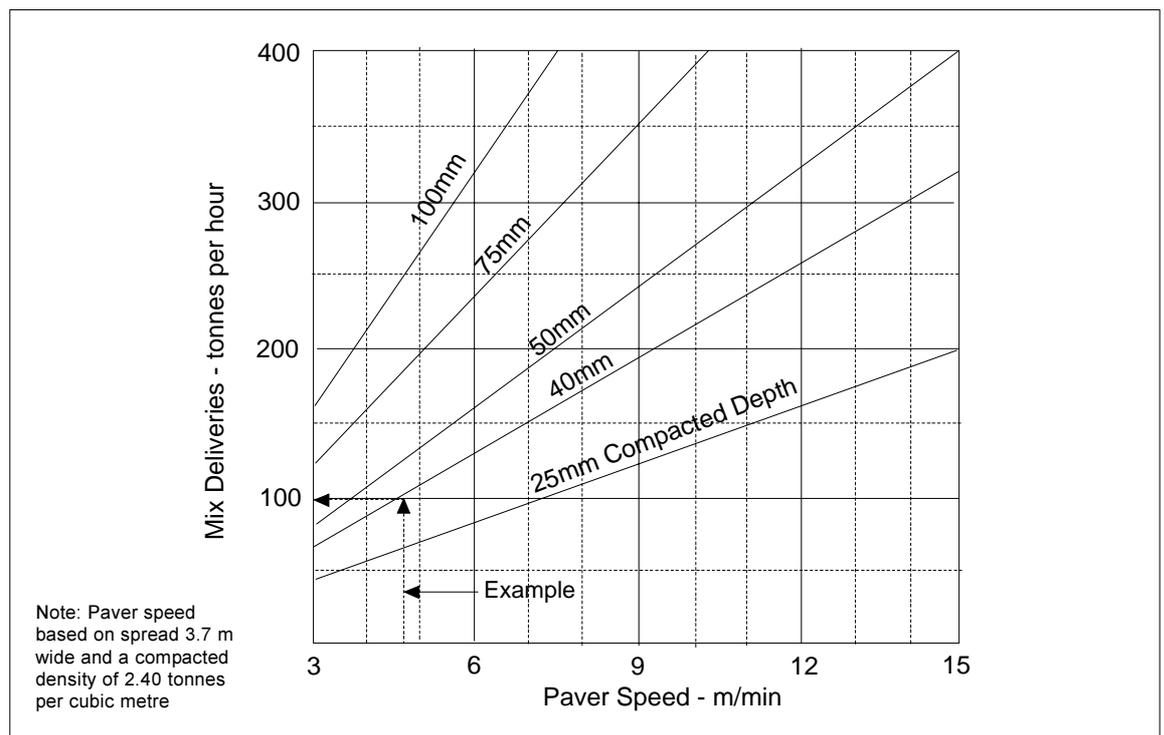
Figure 1 illustrates paver forward speed for various thicknesses of asphalt, a spread width of 3.7 m, and a typical density of 2.40  $t/m^3$ . In the example of roller capacity (over), an average forward speed of the rollers of 4.7 m per minute, and compacted thickness of 40 mm, can be matched to a spreading output, or average mix delivery rate, of 100 t/h.

### Key Summary

*This issue provides a guide to the calculation of paver forward speed for smooth continuous paving and matching roller capacity to ensure effective compaction.*

*continued on reverse*

Figure 1 Paver Speed



## COMPACTION CAPACITY

Rollers have to travel a much greater distance than the paver within a given time frame. The number of roller passes does not increase in proportion to the thickness of layer but net forward travel speed is dependent on the rolling speed and number of passes to cover the paving width.

The primary factors determining production capacity of an asphalt roller are:

- Drum width
- Number of passes
- Roller speed.

Other conditions must also be met, including the number of roller passes required to compact the asphalt and the amount of time that the freshly placed asphalt is exposed before it is compacted. The allowable time for compaction will be reduced when placing thin layers, low pavement surface temperature or when cool winds increase the rate of cooling of the mix.

Allowance must also be made for short breaks (filling with water, etc.), joint compaction, extra distance travelled in changing lanes, and time taken to change direction. Typically, a roller can be expected to work for 50 minutes per hour, with a further 10 to 15% loss for non-productive work, taking the overall efficiency to around 70 to 75%.

Longitudinal overlaps will vary according to how the drum width suits the overall paving width and is generally a minimum of 150 mm.

The total number of passes is the number of roller laps multiplied by the number of passes per roller lap, plus any makeup pass the roller takes to travel over the compacted section in order to reach fresh pavement.

For example a roller of 1.4 m width will require 3 laps to cover a paving width of 2.4 to 3.7 m. One complete coverage (3 laps) with two passes per lap will require 6 passes. Two coverages of the mat will require 6 laps (12 passes).

With an extra lap for the longitudinal joint, the total number of passes becomes 14. A makeup pass brings the total to 15.

In the above example, a roller travelling at 6 km/h (100 m/min) and an overall efficiency of factor of 0.7 for non-productive time and travel, will result in an average forward speed of:

$$100 \times 0.7 / 15 = 4.7 \text{ m/min.}$$

Typical speeds for steel drum vibratory rollers commonly used for primary compaction of asphalt, are 3 to 6 km/h for thick layers and up to 10 km/h for thin layers.

Efficiency of vibratory rollers diminishes with increased speed. Speeds greater than 7 km/h are not commonly used where high density is required.

Forward speed should also be linked to frequency of vibration. Around 33 beats per metre is considered an optimum relationship between frequency and forward speed.

For more information on any of the construction practices discussed in "pavement work tips", please contact either your local AUSTROADS Pavement Reference Group representative or AAPA —  
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Figure 2 Typical Rolling Pattern

