Sprayed Sealing – Rolling of Cover Aggregate

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Key Summary

This issue of "pavement work tips" provides a guide to rolling and compaction of cover aggregates used in sprayed sealing road works.

INTRODUCTION

The performance and life of a sprayed seal is dependent on the bond between the aggregate and binder, and the level of binder up the aggregate particles. Correct rolling in of the cover aggregate is an important field procedure that contributes to achieving this bond.

The aim of rolling is to:

- Press the aggregate particles into the binder, while it is still soft.
- Move and re-orientate the aggregate particles so that they lie as flat as possible, with their least dimension vertical. This will also reduce the air voids between the aggregate particles and force the binder upwards into the mat of spread aggregate.
- Achieve mechanical interlock between the aggregate particles.

TYPE OF ROLLERS

The most effective rollers are self propelled, pneumatic tyred, multi-wheel rollers. Field trials have shown that it is not necessary to ballast this type of roller to achieve the desired initial kneading effect. Drawn multi-wheel rollers may be also used, but they are less efficient, and require care when turning to avoid damage to the new seal.

Steel wheel rollers are not generally recommended for road pavements as they tend to break down the aggregate and do not re-orientate the aggregate particles to have their least dimension vertical. There are some specially developed, rubber covered, vibrating, steel wheel units that are effective and acceptable, provided that the surface being rolled is reasonably flat.

NUMBER OF ROLLERS REQUIRED

The amount of rolling necessary will vary with the area covered and the traffic conditions. On lightly trafficked roads, where the traffic effect is low, it is very important to provide adequate rolling, particularly in areas outside of wheelpaths. On roads with higher traffic volumes, the traffic provides a greater contribution to aggregate re-orientation and embedment, and the rolling requirement is less. Rolling requirements for larger aggregates are greater than for small aggregates. Aggregate orientation is influenced by roller and traffic effects. Wherever possible, the traffic should be controlled and directed to assist rolling.

As a general guide, about one roller hour is required for every 1200 - 1500 litres sprayed. A more detailed guide to roller hours is provided in Table 1. Table 1 gives an indication of the maximum sprayed area (m^2) per roller hour that should be able to be covered in good conditions, taking into account the effect of traffic and aggregate size.

For example, consider 50,000 m^2 of 10 mm seal to be sprayed and covered in 8 hours, i.e. 6,250 m^2 per hour, on a road carrying less than 300 v/l/d. From Table 1, one roller is required for every 3000 - 3500 m^2 per hour, hence two rollers would be required to maintain effective rolling under these conditions.

Aggregate size (mm)	Traffic Volume (vehicles per lane per day)		
	< 300	300 - 1200	> 1200
	Area – m^2 per roller hour		
7or smaller	4000 - 4500	5000 - 5500	6000 - 6500
10	3000 – 3500	3500 - 4000	4500 – 5000
14	2500 - 3000	3000 – 3500	3500 – 4000

Table 1: Area that can be effectively rolled, per hour, with each self propelled multi-wheel roller.

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ROLLING PROCEDURES

General

It is important that the aggregate is rolled before the binder sets up and becomes too viscous to achieve wetting and adhesion. Therefore, the first roller pass must follow as closely as practical behind the spreader(s). In cold conditions, or where polymer modified binders are used, there should be enough rollers to cover the full width of the spray run with one pass.

Initial roller passes should be undertaken without overlapping in order to roll the aggregate as quickly as possible after spreading. After the surface has been covered once, rolling should proceed by overlapping each preceding pass by about one third of the effective roller width, starting at the edges and working towards the centre.

The first two passes should be done at a low speed (5 – 10 km/h) to achieve the aim of pressing the aggregate into the binder, but after that, the rolling speed may be increased to between 15 and 25 km/h to move and re-orientate the aggregate particles to their correct position.

Broom dragging may be used to improve uniformity of aggregate distribution.

Rolling should be continuous and the full width of the seal should receive an equal number of roller passes.

Rolling should be maintained throughout the day and rollers should not be left idle, e.g. between sprayer loads, but used at every opportunity. Rolling should be continued until the aggregate is well embedded in the binder and a uniform surface obtained.

Adequate time must be allowed at the completion of the day's work to ensure that the last materials spread receive the same amount of rolling as that placed earlier in the day. Rollers must be stopped and started smoothly to avoid skidding the wheels which will tear out and damage the new work.

Working under traffic

Traffic should not be allowed on to the new work until the aggregate has had at least one pass with the roller.

In many cases, particularly lightly trafficked roads, rollers need to continue to work on areas that are opened to traffic. In such circumstances, rollers must observe traffic rules and travel in the correct direction on the appropriate side of the road.

When working under traffic, rollers may be used to advantage to control traffic speeds by encouraging vehicles to follow behind the rollers. Keeping the rollers well spaced, and working in opposite directions on two lane, two-way roads, further assists in controlling traffic speeds by discouraging overtaking.

Rollers should only be permitted to operate against the direction of the traffic in controlled areas using lanes which are closed to traffic.

Wet aggregate, including effect of rain on new work

The amount of rolling should be reduced while the aggregate is wet, but normal rolling effort should be carried out as soon as the aggregate dries. Traffic must be kept to a minimum speed during this period, as adhesion between the binder and aggregate cannot occur until the stone dries out and the water has evaporated. Sprayed seals are particularly vulnerable to damage by uncontrolled traffic under such conditions.

SUMMARY

Adequate rolling is essential to ensure that aggregate particles are properly embedded into fresh binder and partly orientated into an interlocking matrix. Subsequent compaction by traffic completes the orientation of aggregate particles and locks them together to form a tight, serviceable mosaic.

Photo shows rollers working in opposite directions as lane is closed to traffic.

*For more information on any of the construction practices discussed in "**pavement work tips**", please contact either your local AUSTROADS Pavement Reference Group rep. or AAPA: tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au.*

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