Sprayed seals – removal of loose aggregate

pavement work tips — no. 28 June 2001

INTRODUCTION

A small amount of surplus aggregate that is not fully incorporated into the sprayed seal surface is a normal consequence of sprayed sealing work.

Where it may have once been acceptable to leave those loose stones to be thrown clear of the pavement by traffic, it is now common practice for early removal of excess aggregate in order to minimise hazards of loose aggregate or vehicle damage caused by flying stones. In urban areas, early removal also reduces stones being thrown on to verges, drainage pits, footpaths, etc.

It is also becoming common to include requirements for aggregate removal in contract specifications. The maximum time allowed for removal may vary from 12 hours to 48 hours, depending on binder type, traffic volume and/or road class.

AGGREGATE SPREAD RATE

The importance of accurate application of aggregate, with minimum overspread, cannot be over-emphasised.

Excessive aggregate spread rates can result in:

- Increased cost due to wasted aggregate;
- Crushing and breakdown of surplus aggregate on the surface;
- Risk of stripping due to dust from aggregate breakdown;
- Risk of vehicles losing control on loose surface materials;
- Increased risk of damage to vehicle paintwork and windscreens from flying stones;
- Increased cost of removal of surplus aggregate.

Accurate spreading requires spreading equipment to be in good condition and monitoring of spreading operations to ensure that aggregate is applied uniformly at the design application rate.

It is generally not feasible to precisely spread the amount of aggregate required for complete shoulder-to-shoulder contact of embedded aggregate, and a small surplus is applied to ensure that there is a minimum of gaps or 'windows' between aggregate in the seal.

Key Summary

This issue of 'pavement work tips' provides a guide to the removal of surplus aggregate from sprayed seals using brooming or suction cleaning.

With good control of spreading operations, the additional aggregate should not exceed 5%, and preferably no more than around 2%, of the total amount applied. Correct spreading will result in some binder being visible between aggregate particles, before rolling, to allow aggregates to settle properly (see Figure 1).

Light drag brooming in combination with rolling and trafficking may assist in correcting small variations in uniformity of aggregate spreading. If feasible, traffic should avoid set wheel paths.

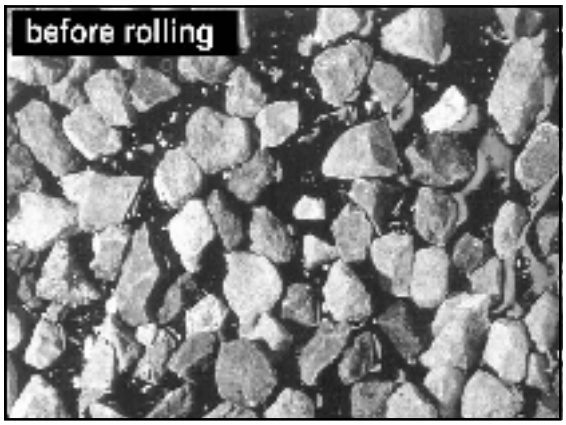

Figure 1. Correctly spread aggregate before rolling

TYPES OF EQUIPMENT AND TECHNIQUES FOR AGGREGATE REMOVAL

Types of equipment used for the removal of aggregate include rotary road brooms, standard municipal type suction sweepers and purpose-built, highway suction cleaners.

Rotary road brooms

Tractor mounted and towed rotary road brooms, of the type normally used for preparing road surfaces for sealing, may be permitted where it is practicable to cast stones aside onto unsealed shoulders/verges, or into channels for pick-up by other equipment.

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Rotary road brooms used for aggregate removal should be in good condition with new, or near new, bristles. The broom must be operated with a minimum of pressure so that the bristles are used with a flicking action to remove surface stones without disturbing aggregate in the new seal. Generally, it is desirable to follow brooming with a multi tyre roller to ensure that any aggregate that is disturbed by brooming is rolled back into place.

Sweeping should start at the centre of the pavement and proceed to the edges, particularly on wider pavements. Anything more than a small windrow should be avoided and several light passes may be preferable to a single heavy pass if there is a significant amount of aggregate to be removed.

Municipal Type Suction Sweepers

Suction sweepers have the advantage of complete removal of aggregate, which is desirable in urban areas to avoid aggregates accumulating in channels, or being thrown onto verges and footpaths.

Suction sweepers of the type commonly used for maintenance sweeping have a small diameter rotary road broom and horizontal gutter broom to move the swept materials into a narrow suction head. Similar care to that applicable to rotary road brooms must be exercised to avoid disturbing aggregate in the seal.

This type of sweeper works most effectively in removal of aggregate from channels or windrows.

Highway Suction Cleaners

Cleaners that use suction only to lift loose aggregate from the surface, without the use of brooms, are the preferred equipment for aggregate removal from new seals.

Generally, these machines are purpose-built to handle the weight and abrasive nature of large quantities of aggregate, whereas the common municipal type cleaner is usually only designed for lighter loads from general road litter.

A suction cleaner should not be stopped with full suction operating.

TIMING OF AGGREGATE REMOVAL

Removal of loose aggregate can generally commence when initial aggregate embedment and interlock has been completed by rolling and traffic, and the binder has hardened to a state where no more aggregate can be pressed into it.

Factors which influence the timing of aggregate removal include:

- Traffic volume/road class
- Type of binder
- Ambient temperature

High traffic volumes will rapidly embed aggregates so that removal of surplus stones may commence within a few hours of spreading. High traffic volumes are also often associated with roads in urban areas and other situations where it is important to minimise risks associated with loose aggregate, so that removal is often undertaken within about 12 hours of spreading.

On lighter trafficked roads, a period of up to 48 hours may be allowed to elapse before completing the removal of excess aggregate.

Polymer modified binders develop cohesion more rapidly so that aggregate removal can often be undertaken on the same day as sealing work.

Emulsion binders develop cohesion more slowly. Up to 48 hours curing may be necessary, in some circumstances, before sweeping can be undertaken without damage to the seal.

Extra care is required at high temperatures, particularly air temperatures of 30°C or more. In such circumstances it is preferable to undertake aggregate removal at night or early morning, when air and pavement temperatures are lower.

TRAFFIC CONTROL

Warning signs, including speed limits if appropriate, should remain in place until there is no further hazard from loose stones.

To ensure safety of personnel and public, traffic control should be maintained while using rotary road brooms and/or back rolling.

Suction sweepers may be permitted to operate without traffic control, provided that appropriate warning signs are in place.

ASSESSING EFFECTIVENESS OF AGGREGATE REMOVAL

Sweeping may not remove all loose stones. Acceptable standards for removal will depend upon traffic volume, road class, etc. The following may be taken as a guide to the average number of loose stone particles remaining in 10mm and 14mm seals after completion of sweeping:

Urban areas	20 particles /m^2
Other medium to high traffic (>250 v/l/d)	30 particles /m^2
Low traffic (≤250 v/l/d)	40 particles /m^2

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 — tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au

A complete list of "pavement work tips" issues is available on AAPA's web site: www.aapa.asn.au

Issues may be downloaded using Adobe Acrobat Reader. Copies may also be obtained from AAPA.

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