pavement work tips

Asphalt Joints

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Key Summary

This issue of 'pavement work tips' describes the techniques which should be used to construct smooth, strong and correctly shaped asphalt joints

Joints in asphalt are unavoidable. They occur when matching to adjoining surfaces, between longitudinal paver runs and transversely at interruptions to paving operations. It is most important that joints do not create a point of weakness due to poor compaction and that correct shape and ride quality are maintained. Some of the techniques used to achieve these objectives are described below.

PLANNING

If possible, joints should be kept to a minimum and placed in areas of least stress. Appearance of finished surfaces also needs to be taken into account. Generally, longitudinal joints in wearing course are placed to coincide with the edges of running lanes, or in the middle of the lane and parallel to lane markings. Where practicable, longitudinal joints in successive layers should be offset by at least 150 mm, and transverse joints offset by 2 m between layers and adjoining runs.

When matching into existing surfaces, the need for profiling must be assessed. For edge profiling along kerb and channel etc, a 0.5 m wide tapered cut is adequate. For transverse joints, a width of at least 1 m is required. For high speed roads this may need to be 2–3 m wide to ensure a smooth transition.

LONGITUDINAL JOINTS

The techniques for matching levels for smooth longitudinal joints, as described below, are fundamental to asphalt paving and generally well understood.

What can be more contentious are the techniques for ensuring adequate density of asphalt across the joint, particularly the density in asphalt placed to a free, unsupported edge. Variations in technique apply to whether the joints are constructed hot, warm, or cold.

Hot joints

Hot joints are ideal. The outer 100–200 mm of the first paver run is left uncompacted until the adjoining asphalt is placed and then straddled by the steel roller to achieve a seamless join. As asphalt must be compacted hot, there must be no delay between adjoining runs, and the technique is usually only feasible when using two pavers in echelon or very short paving runs. Edges should not be exposed for more than about 15 minutes. Hot joints are preferable on open graded asphalt to avoid closing off the air void structure, causing water to well up on the pavement surface.

Warm joints

It is good practice to match up all adjoining longitudinal paving runs for the full width of each days paving work thus creating "warm" joints and avoiding hazards to traffic or damage to the unprotected asphalt edge. The force used in compacting fresh asphalt against the previously compacted run while it is still warm creates a good bond and assists in achieving adequate density.

Cold joints

When asphalt edges have been allowed to become completely cold, an assessment has to be made as to whether the techniques used for warm joints are adequate, or whether further action must be taken to trim the joint back to fully compacted material.

Factors to be taken into account include the depth of the layer (a thick layer and large aggregate size has more potential for segregation and suffers more from lack of lateral support), and the critical performance required of the surfacing at that point.

For small areas, the joint can be trimmed by jack hammer, though long lengths are more effectively trimmed by sawing or using a cutting wheel mounted on a piece of heavy equipment such as a steel wheel roller.

Cutting wheels that trim to an angle of 45° or 60° are considered preferable to vertically cutting wheels and they are less likely to cause damage to surrounding materials. Usually, removal of 50 mm of material is adequate. Cut edges should be tack coated prior to placing asphalt against them.

On small jobs, the density of unsupported edges can sometimes be improved by tamping the edge slightly using an asphalt lute. Some attempts have also been made to develop tapered screed devices to shape the edges of thick lift paving, but are yet to be shown to be practical and effective.

Rolling over the unsupported edge with a multi wheel roller while still warm is an effective means of improving edge density with very little subsequent effect on shape, but is unfortunately, and perhaps unreasonably, specifically excluded in many specifications.

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Placing technique

Asphalt must be spread to a depth such that when compacted, it will be perfectly flush with the adjoining surface, although it can be accepted practice to finish up to 5 mm above concrete channels to ensure that proper drainage is achieved.

Asphalt is spread to overlap the previous mat by about 40–50 mm. Surplus material is then trimmed off or pushed back with a lute. A slight mound created by pushing back is readily compacted in the initial roller pass. The first pass of the steel roller is made by placing the roller on the previously compacted mat and overlapping the fresh asphalt by no more than 200 mm. The roller is thus able to compact the fresh asphalt flush with the previous mat and achieve a high density by concentrating the compactive force on a small area.

The position of the roller can then be shifted gradually across the joint until a thoroughly compacted, neat join is obtained.

It is claimed that modern vibratory rollers can achieve adequate density at the join by making the first pass of the roller on the fresh mat and overlapping the previous mat by about 200 mm. Working space sometimes also requires this procedure be used. Greater precision in setting up the uncompacted edge is required when using this technique as there is less opportunity for the roller to compensate for minor variations in the relative height of the two materials to create a perfectly flush join.

TRANSVERSE JOINTS

When asphalt paving is interrupted, commonly at the start and finish of a day's work, a transverse joint is formed.

When finishing a day's work, asphalt is usually ramped down, if only for construction traffic or to allow rollers to come right to the end of the run. Before paving is continued the next day, this ramp must be removed by cutting the asphalt back to a point where the layer is full depth and even. If there is any doubt as to the extent of asphalt to be removed, a straight edge should be used to determine where the level drops off, and whether any bump has been created by rollers reversing before the end of the run.

Various techniques have been employed to avoid cutting back, such as finishing the run against a timber bulwark and then placing ramping material on paper or a surface covered with sand. This requires good control of surface shape to the edge of the timber and as some cutting and jackhammering is often still required, such techniques are rarely worth the effort. Timber bulwarks should be used on open gaded asphalt to avoid closing off the air void structure.

Asphalt paving commences by placing a suitable uncompacted depth of material. It is important that the paver screed be supported by blocks of appropriate thickness and that the paver is set to spread at the correct depth straight off. Wildly chasing levels as the paver moves away from a transverse joint is a prime cause of bad joins and poor ride quality. Done properly, there should be no requirement for handwork at the join other than removing overlapped material in the same manner as for longitudinal joins.

If, however, adjustment of the surface level is required, it must be done promptly and before rolling commences. Use a straight edge, if necessary, to ensure that the shape is correct.

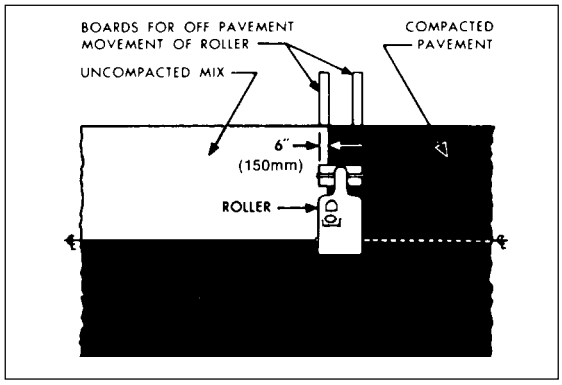
The first pass of the steel roller is made by moving along the longitudinal joint for a short distance. Wherever space permits, the joint should then be rolled transversely. Boards may need to be placed to allow the roller to move on and off the unsupported edge. If boards are not used, transverse rolling should stop 150 to 200 mm short of the outside edge in order to prevent damage to that edge. This small area is compacted later when rolling longitudinally.

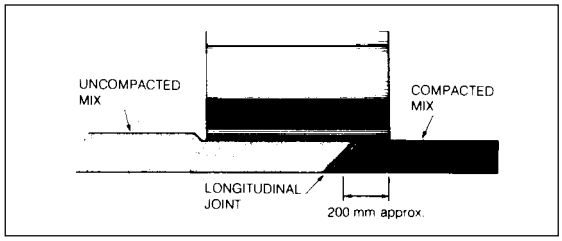
Transverse rolling commences with the roller on the previously laid material and overlapping the fresh material by about 150 mm. Successive passes are then made in 150 to 200 mm increments until the full width of the drive roll is on the new mix. Normal rolling then proceeds longitudinally.

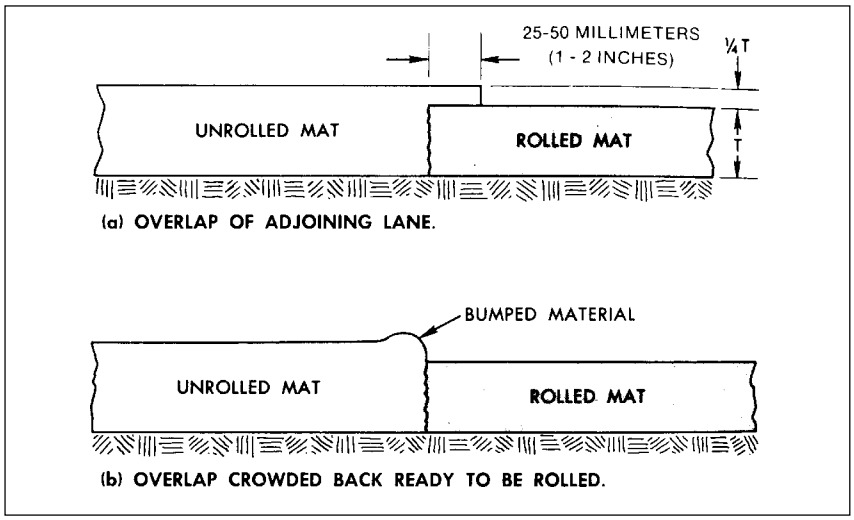
*For more information on any of the construction practices discussed in **"pavement work tips"**, please contact either your local AUSTROADS Pavement Research Group representative or AAPA — tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au.*

Additional copies may be obtained from AAPA.

This edition was prepared by John Rebbechi, in consultation with members of the National Asphalt Research Coordination Group (NARC).







Diagrams showing good joint construction practice.
Top left: rolling a transverse joint;
Bottom left: longitudinal joint rolling procedure — vibrating roller;
Above: constructing and preparing longitudinal joints.