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Cold Longitudinal Joint Construction

Which Technique is Best?

The technique of constructing good performing longitudinal joints continues to be a topic of concern for the asphalt paving industry. The National Asphalt Pavement Association (NAPA) published a manual on the subject in 1997 (2). The National Center for Asphalt Technology (NCAT) has been studying and comparing joint construction techniques since 1992 and has issued four reports of its findings (3, 4, 5 and 6). Manuals on hot mix asphalt (HMA) pavement construction (1, 7) contain guidance on placing and compacting cold longitudinal joints. Still, there is a lack of consensus within the industry on a best technique for constructing good performing longitudinal joints.

The NAPA manual states that, "a variety of techniques have been successfully used to construct good, longitudinal joints." The NCAT research identifies several techniques that produced better results than others within the scope of its review. There is little agreement between the various manuals of practice as to the proper or best technique. The industry needs practical guidance on straight-forward methods that can produce good results, consistently and economically.

> [Construction of good performing cold longitudinal joints requires the proper equipment and its careful use by skilled operators.]

Theory versus Reality

It is universally believed that lack of density or compaction is the reason for porosity and subsequent deterioration at longitudinal joints. It is often supposed that the problem is with the mat placed in the first pass. The unconfined edge of the first pass cannot be compacted to the same potential density as the center of the mat or the confined edge of the matching pass. In theory the confined edge of the matching mat can be compacted to the same density as the rest of the mat, if properly placed and rolled. However, in practice, it is often the matching pass side of the joint that gives the poorest performance. While the first

pass will have an acceptable degree of density, if correctly rolled, it is possible to place the matching pass so that the area next to the joint receives little or no compaction. If the paver operator fails to place enough extra thickness of uncompacted material to roll down to full density or if the extra depth of material is pushed away from the joint by use of a rake or lute, the roller will bridge the matching side of the joint and compaction will not be achieved.

To combat this deficiency, many agencies have, or are contemplating, a density requirement for longitudinal joints; usually about 2-percentage points less than the average required for the mat as a whole. The Ohio Department of Transportation (ODOT) addresses joint compaction by including density measurements taken at the joint in the calculation for determining payment. The approach taken by ODOT will help ensure that the agency is not paying for poor longitudinal joint construction. How the contractor obtains compaction on these projects is not specified. It's still up to the contractor which technique to use to build good joint density.

So, is there no single method that can consistently produce good performing longitudinal joints, using conventional equipment, without a lot of extra work and expense? We think there is.

Recommended Technique

First pass: Use a paver that has an end gate that extends all the way to the back of the screed for some confinement of the edge (all pavers built since December 1997, have this feature as a result of a NAPA committee agreement (2)). Operate the screed in the vibrating mode. The extra 10 percent initial compaction may be critical. It is certainly more economical than adding additional roller passes to obtain the same density. Operate the paver in a straight line so the mat has a straight edge that can be properly overlapped with the matching pass. Roll the unsupported edges of the mat as quickly as possible with a double-drum vibratory roller operated in the vibratory mode. Position the roller with the drums hanging in the air about six inches over the edge of the mat. Set the frequency to the maximum. Set the speed so as to obtain 10 or more impacts per foot. Set the amplitude as appropriate for the thickness of the mat (thinner layers require lower amplitude). This technique gives the highest level of compaction possible on the unconfined edge and minimizes cracking and shoving of the material at the edge of the mat. Don't try to use a rubber-tired roller on this first pass; it will cause the unconfined edge to push out.

Matching pass: Tack coat is usually not needed on the vertical face of the first pass, if the material along the joint is clean. If tack coat material is placed, it should be placed uniformly with a distributor. Place the matching pass in a straight line with a consistant overlap onto the first pass of 1 inch to -1 1/2 inches, so as to provide some extra mix to be rolled into the joint. (Note: if the matching pass is placed against a vertical, sawed or milled edge, the amount of overlap must be only about 1/2 inch) Place the proper depth of uncompacted mat to allow for proper roll-down to optimum density and to end up flush with the first pass (this is usually considered to be one and one-quarter the thickness of the compacted first pass). Don't rake the joint! Roll from the hot side with the rolls of the vibratory roller hanging about 6 inches over the first pass. Use the same roller settings

Compacting the First Pass

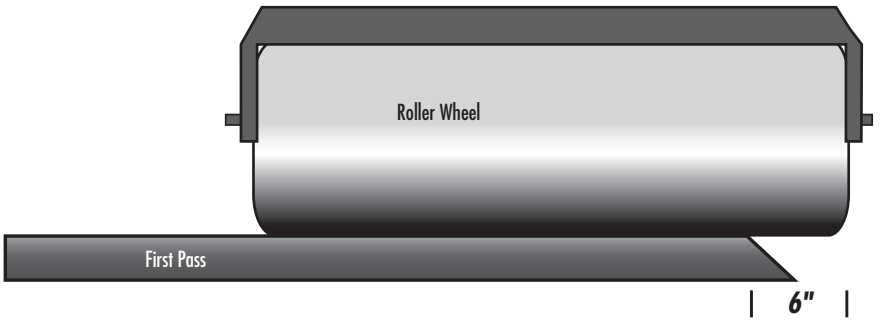

fig.1

Placing the Matching Pass

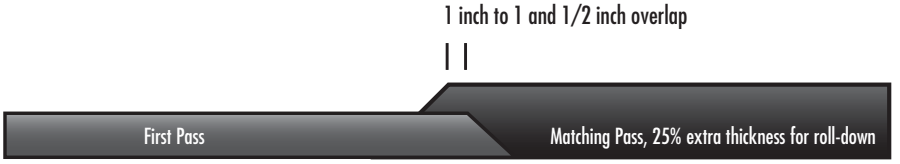

fig.2

as previously recommended. Using a rubber-tired roller may be very beneficial in getting good joint density. Even if the paver operator fails to get just the right amount of thickness or overlap, the rubber-tired roller may be able to get optimum density at the joint. If a rubber-tired roller is used, place the center of the outside tire over the joint.

Summary: Construction of good performing cold longitudinal joints requires the proper equipment and its careful use by skilled operators. Following these procedures recommended here can consistently produce good performing joints with a minimum of extra work and cost.

Of course, mother knows best. She may have once told you to "stay out of those kinds of joints!" This is also good advice with respect to cold longitudinal joints. No joint or a hot longitudinal joint is always preferred, if project and traffic conditions permit. Full-width paving eliminates any joint concerns. Although echelon paving is costly, requiring multiple pavers and their crews, the hot longitudinal joint it produces can be compacted to the same density as the overall mat. A hot longitudinal joint has none of the inherent drawbacks of the best constructed cold longitudinal joint.

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Compacting the Matching Pass

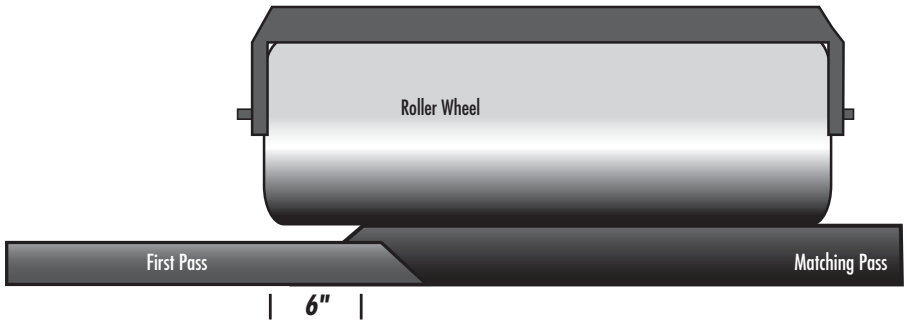

fig.3

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