Longitudinal Joints

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Methods

Contractors employ several common breakdown roller patterns to achieve compaction at the joint and mitigate the potential for poor density.

The Butt Joint is the most common approach for joint construction with a vertical edge between adjacent lifts.

The Maryland Method involves a small overlap at the joint with the adjacent pavement lane.

The Notched Wedge Joint features a tapered, or "wedged," edge on one side of the newly laid asphalt mat rather than a vertical edge.

Milled or Cut-Back methods remove a portion of the newly laid, compacted asphalt along the longitudinal joint to create a clean, vertical face.

Edge Restraining Device is a tool or attachment used with an asphalt paving machine that helps maintain the shape, consistency, and density of the edges of the laid asphalt mat.

Echelon paving is where two or more pavers work side-by-side in parallel lanes to minimize the time between the placement of adjoining lanes.

Foreword: Roads are more than just pathways; they're essential to our economy and well-being. One critical aspect of roadway durability is the construction of asphalt longitudinal joints. Done correctly, these joints help ensure long-lasting roadways; when done poorly, they result in costly maintenance and repairs. This mini brief summarizes the CAPRI TechBrief entitled *"Asphalt Longitudinal Joint Current and Best Practices."*

Summary of Best Practices

Planning and Design Phase:

1. Evaluate traffic control for echelon paving possibilities to reduce cold joints.
2. For mill-fill projects, consider one lane at a time to avoid unconfined edges and ensure milled surface cleanliness.
3. Review and allow cut-back joint methods prevalent in the U.S. airfield projects and UK roadways.
4. Offset joints by at least 6 inches between layers unless overlaying concrete pavement.
5. Strategically place surface lift joints to bypass wheel paths, striping, and centerline rumble strips.
6. Have clear specifications for joint placement, testing, and acceptance.
7. Ensure lift thickness is at least 4x Nominal Maximum Aggregate Size (NMAS) for coarse-graded mixes and 3x NMAS for fine-graded mixes.
8. Select less permeable surface mixes using the appropriate/ smallest NMAS mix.
9. Consider warm mix asphalt (WMA) technology for late-season paving and to serve as a compaction aid.
10. Consider using a notch wedge joint for a 1.5 to 3-inch lift thickness.
11. Separate bidding for tack coat to ensure sufficient application.
12. Discuss joint-related topics in the pre-paving meeting, including options for treating the cold side of the joint.
13. Prioritize paving from low to high elevations for efficient water flow.
14. Evaluate joint enrichment methods post-construction to increase longevity.

During Pavement Placement:

1. Avoid mix segregation.
2. Ensure a smooth paving operation without interruptions.
   Utilize material transfer vehicles.
3. Utilize a string line for first-pass straightness.
4. Apply an ample and uniform tack coat.
5. Ensure seamless truck-paver coordination/operation.
6. Maximize paver automation for joint density.
7. Synchronize paver and auger speeds.

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8. Extend augers close to end gates to prevent segregation.
9. Properly set the end gate.
10. Keep the vibrator screed activated.
11. Ensure 1-inch overlap for butt or notched wedge joints; 0.5-inch for milled joints.
12. Avoid excessive luting/raking. Don't starve the joint.
13. Aim for the hot-side joint to be slightly elevated post-rolling.

Treating the Cold Side Joint:

1. Consider infrared joint heaters, especially for cold-weather paving.
2. Consider joint adhesives for durability and sealing.
3. Consider innovative materials designed to reduce or fill the voids at the joint.
4. At a minimum, tack the joint face.

Rolling and Compaction:

1. Compact unconfined edge with a vibratory roller.
2. Compact confined edge with a vibratory roller without immediate overlap.
3. Use rubber tire rollers for intermediate rolling near the joint.

Specification Approaches:

1. Steps for implementing new joint specifications include collaboration with industry, training, baseline establishment, incremental changes, and a robust evaluation plan.
2. Aim for a minimum joint density of 2% lower than the mat density or at least 90% Theoretical Maximum Density (TMD).
3. Target in-place air voids of less than 7-8% for surface mix types on high-volume roadways.
4. Ensure consistency in density testing locations around the joint.
5. Use 6-inch cores centered over joints for density analysis. For the notched-wedge joint, center cores over the middle of the wedge.
6. Implement a payment scale based on TMD percentages.
7. Consider incentive/disincentive payment to drive innovation.
8. Contractors should include longitudinal joint testing in their quality control.

Access the full TechBrief at:
https://capriasphalt.us/research/completed-research.html

Explore CAPRI here: https://capriasphalt.us/

Materials

Various materials have been developed to improve longitudinal joint performance, which are placed during construction or maintenance, each with unique properties and applications.

Joint Adhesives are specialized, rubberized asphalt-based compounds applied to the joint area before the adjacent lane is paved.

Joint Sealers are applied on completed longitudinal joints to fill any gaps and prevent or limit water infiltration.

Fog sealers are light applications of diluted emulsions sprayed over the surface of the asphalt, including the joints.

Crack Sealing and Filling are specialized treatments for cracks that appear over time, which can also be used with deteriorating longitudinal joints.

Micro-surfacing is a protective seal coat that combines asphalt emulsion, aggregate, mineral filler, and water.

Void Reducing Asphalt Membrane (VRAM) (a.k.a. Longitudinal Joint Sealant) is a pre-applied, liquid membrane that reduces air voids in the asphalt layer when it is placed and compacted. It improves the density and bonding at the joint, resulting in a more durable and long-lasting road surface.