

CENTERLINE

Crossovers improve asphalt pavement quality, save time, and result in significantly safer work zones

When it comes to road construction, we like to say that safety is the number one priority. In reality, it is more complicated. Typically, we trade safety for mobility, to keep roads open and traffic running as smoothly as possible. Why?

There is an unwritten assumption that we should avoid closing a road – that we must balance the dangers created by having crews working next to live traffic with our concerns about the trucking industry’s need to transport goods and the public’s inconvenience or level of annoyance. But if there is a problem with a bridge, for example, or if a landslide takes away a portion of a road, safety clearly outweighs any inefficiencies and traffic hassles.



Using a crossover on OR99W provided separation between the workers and traffic.

Paving in a more continuous way means more paving can be done in a single shift, which lessens the number of transverse joints and improves overall paving quality.

So should we question our assumptions about other scenarios too?

There are different ways to stage a project. Typically we do one of three things:

- 1) Completely close the road** – Mostly used when there is no other alternative (e.g., major bridge repairs and blocked roads).
- 2) Crossover** – Used less frequently now than in the past because it can cause traffic delays and we assume that drivers have limited patience.
- 3) Nightly single-lane closures** – The current standard because it has the least impact on driver convenience.

Each of these options has different impacts on timing for construction, mobility for drivers and safety for road workers. A recent OR 99W project illustrates these issues well and invites us to rethink our assumptions.

Highway OR 99 West A Case Study in Crossovers

In 2021 ODOT let a contract for pavement repairs on OR 99W, near Eugene. The northern portions of the project were to be constructed using traditional nightly single-lane closures because there were numerous resident and business access points. The contract allowed the contractor to use directional crossovers for southern portions. OR 99W does not have a median or other structure separating the directions, so the contractor would work on one side, and traffic would be shifted to the other side such that traffic would be traveling in both directions on the other side separated by tubular markers.

Let’s take a closer look at each of these options.

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A Case Study in Crossovers (cont.)

Single-Lane Night Paving

Paving one lane at a time at night is primarily done for the convenience of drivers, but it has disadvantages:

- **Risk:** In almost every scenario night paving with single-lane closures brings vehicles closer to where the work is taking place. While there is less traffic at night, drivers can't see as well, they tend to be driving faster, and there is a higher risk of encountering sleepy, distracted or drunk drivers, which presents a hazardous environment for workers. The difference between 25 mph and 45 mph is huge when a worker is standing 12 inches away from a moving vehicle.
- **Law Enforcement:** Due to these increased hazards, law enforcement presence is important, particularly at night. But with law enforcement staffing shortages, it can be challenging to get officers assigned for construction at any time of day.
- **Visibility (or lack thereof):** Asphalt is black and difficult to see at night, so mistakes and problems are harder

to catch. Workers can set up lights, but that adds time and cost to projects – and lights, quite literally, pale in comparison to the sun.

- **Quality:** If you pave in single-lane nightly closures, you have a limited work window because you need to wait for traffic volumes to subside in the evening and you need to be off the road by the time traffic volumes pick back up in the morning. The next night you start where you stopped the night before, and repeat. Every stop and start creates a joint (a transverse joint), which creates a weak point in the pavement that will often fail before the rest of the pavement – because it is hard to compact those joints. When compacting transverse joints next to traffic there's not enough room for the rollers to roll in the direction of the joint (which, for quality, is better than rolling back-and-forth across the joint). Additionally, material at the mat edge cools faster and cooler asphalt is harder to compact. The fewer the joints, the better.

- **Quantity:** Every stop and start also takes time. Workers need to get the equipment ready, set up signs, barrels, and markers, make judgments about when it is appropriate to shift traffic, and at the end of the shift, they need to take everything down and put it away. Over the course of a project, the time it takes to do that every night can add weeks, if not months, to a project. The fewer the stops and starts, the better.



Flaggers managed traffic at the intersections when the crossovers were being used.

Weekend Crossover Paving

Crossovers may seem like a bigger hassle because drivers need to shift to a completely different side of the road and the configuration typically stays in place during the day and night. However, when done over a weekend, crossovers don't greatly impact commuter traffic and eliminate many of the nightly single-lane closure disadvantages.

- **Reduced risk:** When traffic is crossed over, there is more space between vehicles and where workers are placing asphalt.
- **Law Enforcement:** Daytime work, with better visibility, slower traffic and fewer impaired drivers, makes the ongoing presence of law enforcement officers a bit less critical.
- **Visibility:** This one's obvious! But in addition to being able to better see what they are doing, workers don't have to spend so much time setting safety markers along the lanes they're working on, and there's no need for lighting. Workers get working faster and can more easily check work as they go.
- **Quantity and quality:** Paving in a more continuous way means more paving can be done in a single shift, which lessens the number of transverse joints and improves overall paving quality.

So how did it go for OR 99W?

After starting and using the crossovers successfully for the southern portions of the project, ODOT and Riverbend Materials, the contractor, realized that crossovers would work for the entire project and would be far more efficient and safe. The two organizations collaborated on a crossover plan for the remaining work and successfully completed all of it with weekend crossovers. Here's what they learned...

Higher efficiency – Night-only shifts typically allow for placement of 2,200-2,400 tons of asphalt. Paving the total tonnage in nightly closures would take about 14 shifts/nights. In this case, they were able to grind up the existing surface Friday night, pave Saturday during the day, grind Saturday night, and pave Sunday. Riverbend placed about 8,000 tons each weekend over four weekends!

- Weekend 1 (7/30 and 7/31): 8,396 tons
- Weekend 2 (8/6 and 8/7): 8,678 tons
- Weekend 3 (8/20 and 8/21): 7,959 tons
- Weekend 4 (8/27 and 8/28): 7,908 tons

Greater safety = lower stress = better quality – Because they used the crossover, Riverbend noticed a significant reduction in worker stress, as there was a great deal more room between workers and adjacent traffic. That stress reduction improved workers' overall attention to detail, resulting in better quality work and fewer unnoticed mistakes.

More law enforcement support – Local and/or state police were present for each weekend shift. (Due to Oregon State Police staffing challenges, ODOT and Riverbend successfully coordinated with the local Junction City police to provide support.) Police presence improved driver behavior and significantly slowed the speed of traffic in the work zone.

TIMING MATTERS

Timing can be a complicating factor. With nightly single-lane closures the timing is inherent in the name. Complete closures and crossovers don't have any required timeframe: you could close a road and not open it until all of the paving is done, or you could close it on weekends or on any random weekdays.

Choosing the timing of closures and crossovers wisely can significantly cut down on the length of a project overall. For example, the Banfield Expressway in Portland was repaved a decade ago using weekend directional closures that ended up taking 2.5 weekends per direction. The alternative – nightly single-lane closures – would have had workers next to traffic every night, and it would have taken at least 3 months, if not longer, to complete.

Better pavement quality – In addition to weekend crossovers creating a safer and more efficient process, the overall quality of the paving was better. Asphalt pavement smoothness is all about continuous paving – the goal is to start paving and move continuously at the same speed for as long as possible. The longer a paver can go at a continuous speed, the smoother the resulting surface.

Because ODOT and Riverbend were able to pave significant portions of OR 99W continuously, the surface is exceptionally smooth. Smoother roads not only last longer, they also result in fewer greenhouse gas emissions from the vehicles

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The OR99W project was awarded 1st Place in the Smoothness category as part of the 2022 Annual Paving Awards – largely due to crossovers minimizing transverse joints.



People working in the field on road construction projects also appreciate how crossovers make their work safer and less stressful.

“In 29 years of paving this is the first time I have been able to focus more on the work rather than who’s coming at me,” said Jim Hodgen, Roller Operator for Riverbend Materials.

Making Crossovers Work for You

The key to making weekend crossovers work is communication. Night paving has become the de-facto method, not because it’s better, but because we weight our assumptions about driver patience heavily – without explaining to drivers the tradeoffs in cost, quality and safety.

A Case Study in Crossovers (cont.)

using the road, and drivers appreciate less wear and tear on vehicles.

“When used appropriately, crossovers can offer multiple benefits, which include safer work zones for construction crews, higher quality of product, reduced impacts to the traveling public, and the potential for cost savings,” said Shane Prohaska, P.E., ODOT Resident Engineer on the project. “Construction crews have to constantly be on alert when paving next to traffic, as work zones can be very limited on available room, especially highway paving. Crossovers help eliminate the danger from working right alongside traffic and allows crews to focus more on the work they are doing. In addition, quality is also improved due to the longer asphalt pulls you can accomplish, which results in fewer joints and smoother ride. Reduced traffic impacts are generally accomplished as well, due to the ability to do more work over a shorter duration, which often means less burden on the traveling public in the long run. The OR99W: 1st Ave. – Enid Rd. project was an excellent example that demonstrated the benefits of crossovers.”

Shifting to weekend crossovers requires that we communicate clearly why road work is being done this way. The lessons learned on OR 99W provide excellent messages that will resonate with the public, including:

- Makes work zones safer – for workers and for vehicles,
- Increases the speed and efficiency of paving projects,
- Reduces costs compared to using the extra safety and lighting equipment required for single-lane night paving,
- Creates a smoother road surface for a better driving experience and less wear on vehicles,
- Reduces GHG emissions – making paving and driving more sustainable.

Getting out ahead of construction projects and communicating these messages can help build public support and facilitate an easy transition to a safer, more efficient paving process.

According to John Hickey, Executive Director of the Asphalt Pavement Association of Oregon, “If people knew that using crossovers has real financial, quality and environmental benefits, they would pick crossovers over nightly single-lane closures almost every time.”

Connecting with the Next Generation of Workers

by John Hickey

What is important in a career?

The usual answer includes money, opportunity, making a difference, job security, and balance.

What do many kids overlook?

How important it is to develop transferable skills – skills that will help you succeed in any career or position.

Working in the asphalt pavement industry helps develop important transferable skills, including:

Planning: Asphalt pavement is perishable in the sense that it is mixed at hot temperatures and must be placed and compacted before it cools too much. Additionally, asphalt pavement is used for roads and highways that enable our economy to function. As a result – time is critical for every paving project, and companies need to precisely analyze quantities, distance, workforce requirements, weather and production rates – all of which require planning and applied math skills.

Budgeting: Market competition is a fundamental construction principle. Companies succeed or fail based on whether they can perform work more efficiently than their competitors. Paving companies need to predict costs and develop budgets that are as accurate as possible. Remaining cost-effective also requires employees who are extremely good at what they do and who are constantly striving to get better.

Communication: Roads and highways are essential for the economy and our way of life. This means every construction project requires clear communication with multiple stakeholders about things like what is need-

ed to build and maintain roadways and to make sure communities are aware when work that might disrupt traffic will occur.

Documentation: Site and environmental conditions impact paving, so they must be documented before work takes place. If a contractor anticipates sunny weather and a smooth hard base surface on which it will be paving, but instead it is cloudy and cool or the base is soft and rough, the contractor needs to document those different conditions before paving – then communicate the likely impacts and risks to the owner.



Last summer's Knife River interns, haul truck drivers Mary Weitman and Bailey Womack.

People: Roads cannot be made in China and used in Oregon – the asphalt pavement industry is inherently local. Asphalt pavement uses mostly local resources (e.g., aggregates), is designed by professionals who understand those resources and the local conditions, and manufactured and placed by workers who live in the community. No part of the process can be effectively outsourced. The industry requires people from the community to work together as a team – and that requires “people skills.”

I often say that if someone can succeed in the asphalt pavement industry, they can very likely succeed in any industry. That is because the skills listed above are extremely valuable in every industry.

When these skills are incorporated into the K-12 educational curriculum at the appropriate level, and strengthened with real-world examples and experience, students are better prepared for the working world.

We have a tremendous opportunity to make a difference here – yet the asphalt pavement industry has become disconnected with K-12 education.

That's why APAO is taking action to solve this problem!

Teacher Continuing Education: APAO is a regular presenter at educational events and conferences for teachers where we help connect concepts teachers are teaching to how they

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Connecting with the Next Generation (cont.)

apply in the real world. We give teachers the answer to the question students often ask: “how am I ever going to use this stuff?”

Work-Based Learning Projects:

APAO developed a project that teachers can use in their classes that ties together many of the subjects taught in high school and many of the skills used in the industry. Groups of students work together as their own hypothetical paving company and prepare a proposal for the construction of a new parking lot and the construction of a new road associated with a multi-family development on the Oregon coast (an actual project). The students must use:

- Math skills (e.g., algebra, geometry, unit conversions, area and volume calculations) to determine quantities and prices,
- Planning skills to schedule the work based on expected production rates and varying shift lengths,
- Communication skills to develop materials that will be used to communicate with the neighbors and surrounding community,
- Marketing skills so that the owner trusts that they can deliver the project on time and in budget, and
- Presentation skills to prepare a written and oral proposal to a group of experienced contractors representing the owner.

Every team has access to a mentor from the industry to answer industry-specific questions. The group acting as the owner rates the written proposals and oral presentations – and the winning teams from each class are awarded scholarships of **up to \$1,000 per team**.

Summer Work-Based Internships:

The assumption used to be that the minimum employment age to work in construction in Oregon was 18. After working with the Oregon Bureau of Labor and Industries (BOLI), APAO and others were able to clarify that 16- and 17-year-olds may work in the industry, provided the employer obtain a BOLI permit. APAO has helped members from across Oregon obtain permits and has successfully piloted a work-based learning program under which the student, their parents, the school, and the employer agree to a summer employment program that focuses on learning by doing. The students are expected to work as part of the field crew, in asphalt laboratories, or in the shop, and there are periodic reviews over the season during which certain skills are discussed (e.g., communication, punctuality, resilience, entrepreneurial mindset, adaptability, collaboration). The students make money (usually much more than their peers), develop skills, and learn about our industry before they graduate.

Get involved in preparing the next generation for the workforce!

Please contact APAO if you are interested in participating or if you know of a teacher who might be interested in working with us. APAO’s goal is to create a win-win-win: the students win by developing transferable skills that will help them in whatever career they choose; the teachers win because they have a better understanding of how what they are teaching gets used in the real world (plus they’ll have more engaged students); and the paving industry wins because more kids are exposed to the industry and will consider asphalt pavement careers. ■

MISSION STATEMENT

The Asphalt Pavement Association of Oregon, Inc., (APAO) is dedicated to promoting the use of asphalt concrete by developing customer driven programs to enhance quality and excellence in all aspects of asphalt technology. We believe that the key to growth and prosperity in the industry is continuous quality improvement obtained through active association membership, positive customer relationships, education, and training.

APAO MEMBERS

For quality asphalt projects, call one of our members.

Paving Company Members: 7 Peaks Paving; American Rock Products; Bayview Asphalt; Brix Paving; CPI, Inc.; Eagle-Elsner, Inc.; Granite Construction; H&H Paving; Harney Rock & Paving; High Desert Aggregate & Paving, Inc.; Humbert Asphalt, Inc.; Jim Turin & Sons Enterprises, LLC; K&L Industries; Kerr Contractors; Knife River Northwest; Knife River Materials; Knife River Mainline; Knife River – Mount Hood Rock Products; Kodiak Pacific Construction; Lakeside Industries; North Santiam Paving; Portland Road & Driveway; Riverbend Materials; Road & Driveway Co.; Robco, Inc.; Rocky Mountain Construction; Roy Houck Construction; S-C Paving; Siegmund Excavation & Construction; South County Asphalt; TFT Construction; Tidewater Contractors; Tri-County Paving; Siegmund Excavation & Construction; Umpqua Aggregate Resources; Wildish Construction

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Industry Partners: Northwest Utility Contractors Association; Oregon Chapter of the American Public Works Association; Oregon-Columbia Chapter of the AGC; Oregon Concrete & Aggregate Producers Association; Oregon Department of Transportation; Oregon Institute of Technology; Oregon State University; Portland State University

Safety Tech Spotlight: Portable Rumble Strips

Rumble strips are effective. Where they exist, drivers know it when they veer onto road shoulders, lane edges and centerlines. The road construction industry has recognized the potential benefit for work zones – rumble strips slow traffic and the sudden sounds and vibrations cause drivers to focus on driving safely. But, grooving pavement for work zones is impractical because work zones are temporary and usually move.

In the past, a few agencies and contractors experimented with portable rumble strips, but initial versions were problematic. Strips shifted too much when trucks traveled over them, and deployment and retrieval proved to be difficult and dangerous.

These issues are addressed by RoadQuake 2F temporary portable rumble strips. This technology has been shown to be effective at alerting drivers to work zones and slowing them down – with minimal unwanted movement from trucks or traffic.

While we don't typically promote any specific vendor or product, the initial use of the RoadQuake 2F TPRS in Oregon has been positive and we believe the potential safety benefits are substantial enough that agencies and contractors should start using and experimenting with them. Initial projects have shown that these portable rumble strips:



RQ 2F Arrays, Richfield UT, May 2018

- Generate similar sound and vibration as milled strips, making them effective at alerting and slowing traffic before a flagging station;
- Can be used in the travel lane adjacent to the work zone, which is helpful where there is a long work zone and there is a need to slow and alert drivers before they reach an area where work is occurring (even in multi-lane situations where there may be no flagger and traffic is shifted via cones or barrels);
- Do not cause problems for motorcycles;
- Can be deployed, retrieved and adjusted as needed with a crew of two (there is no glue or connecting mechanism to install or remove);
- Can be carried in a rear-mounted cargo carrier; and
- Can be deployed, adjusted, or retrieved with a truck-mounted machine that eliminates the need to have workers in the road.

The manufacturer reports that RoadQuake strips typically last 3-5 years under normal conditions and are suitable for use in rain and temperatures from 0° to 180° F.

This new technology has the potential to make our work zones substantially safer, and we encourage agencies and contractors to consider trying them and giving us feedback. The PSS Innovations [RoadQuake 2F TPRS](#) are available in Oregon and throughout the Pacific Northwest from [Coral Sales](#).



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SAVE THE DATES

Nov 30 – Dec 1, 2023: APAO Annual Meeting, Riverhouse on the Deschutes, Bend, OR

Feb 14, 2024: Annual Oregon Asphalt Pavement Conference,
Salem Convention Center, Salem, OR

Feb 15, 2024: Annual Industry & ODOT Work Zone Safety Symposium,
Salem Convention Center, Salem, OR

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