

Concrete Overlays and Maintenance of Traffic



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Traffic Management - Concrete Overlays

Top 20 Elements

1. Traffic congestion-capacity analyses-lanes required, length of queues anticipated, large trucks, construction speed, etc
2. Time restrictions—peak hours, seasonal peaks
3. Limits to work areas & local access
4. Detour routes and their capacity
5. Work vehicle access and worker parking
6. Bicycle and pedestrian traffic (urban)
7. Warning sign locations—detours, long queues, intersecting roads
8. Nighttime restrictions, delineation and illumination
9. Signals, turning lanes, bus stops
10. Traffic service—residential/business



Traffic Management - Concrete Overlays

Top 20 Elements (continued)

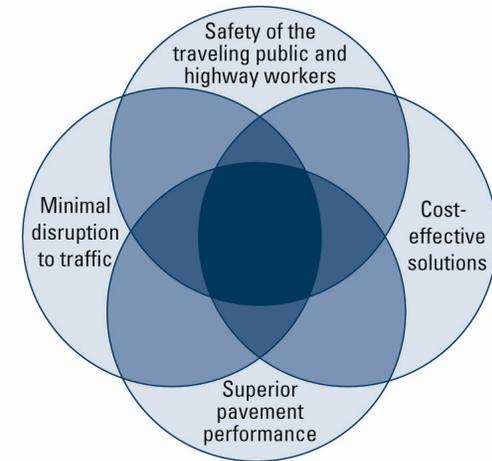
11. Opening to traffic—maturity, strength requirements, cure time
12. Off-peak traffic hours for increased production
13. Phasing of work—length of work zone, project limits
14. Special conditions such as dropoffs, bridge installation
15. Pre-paving and paving restrictions
16. Short duration closures anticipated
17. Emergency planning
18. Public information—public meetings with landowners, media,
19. Local officials—police, fire, hospitals, schools, railroads, airports
20. Special events



Work Zones under Traffic

Traffic Management - Concrete Overlays

- Objectives of work zone management
 - Safety
 - Traffic flow
 - Cost effectiveness
 - Pavement performance
- Considerations
 - Work zone space considerations
 - Paving clearances
 - Traffic control for contractor & public
 - Concrete overlay staging – set criteria and let contractor propose solution



Work Zones under Traffic Safety Considerations

- A well thought out traffic control plan is essential.
- Where possible, establish detours to accommodate intersections.
- Temporarily shutting off intersections for paving allows for smooth and efficient concrete placement.
- Proper staging of operations allows the contractor to complete work phases more efficiently.



Work Zones under Traffic Traffic Flow

- “All reasonable mitigation measures should be assessed in an effort to keep the delay below the threshold limits”
- This can amount up to 25% of the projects cost
- Minimize disruptions to traffic in work zones
- Involve public officials and the public during early stages of project planning
- Broadly publicize the work zone well before construction begins



Work Zones under Traffic

Cost Effectiveness

- Traffic strategies in work zones can significantly affect project costs
- Traffic control costs and construction costs should be balanced against the impact on the public
- Many urban intersections have been overlaid with concrete utilizing only weekend work hours
- Partly or completely closing a work zone to traffic can help minimize traffic management costs



Work Zones under Traffic Cost Effectiveness - continued

- Reducing the frequency of work zones
- Reducing the length of time work zones are in place
- Reducing the volume of traffic through the work zone (where possible)
- Consider either road closure or detours & crossover(s)



Construction Operations and Traffic Management for 2 or More Lanes



Concrete Overlay Construction, 4 Lanes - Open or Closed to Traffic?,

- Always analyze the option of closing roadway, where feasible.
- However, concrete overlays can be successfully and cost-effectively constructed without closing the roadway to traffic
- Concrete overlays may be constructed on four or more lane divided roadways without crossovers as well as head-to-head traffic or on 2 or 3 lane roadways



Case 1: Traffic Movement, Four Lane (Divided)

Move traffic to one side and begin work on other side



Head to Head Traffic

Switch Traffic to other side and remove and replace other pavement



Head to Head Traffic



Issue:

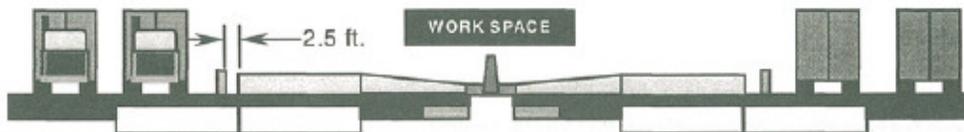
1. Head to Head Traffic
2. Build Crossovers

Case 2: Traffic Movement, Four Lane (Divided)

Widen inner shoulder - place interlayer - move traffic using lane shifts as needed

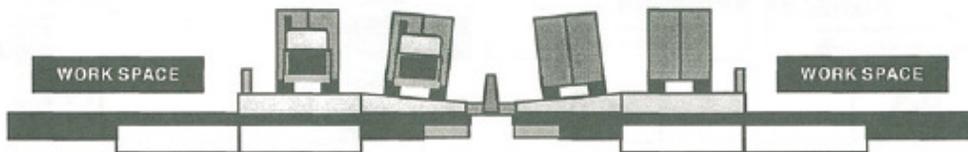


Move traffic to outside and overlay inner lane and shoulder



- Haul on interlayer (recommended) - requires dowel inserter (DBI)
- Haul in traffic lane (less preferable) - requires flagger control near paving for access

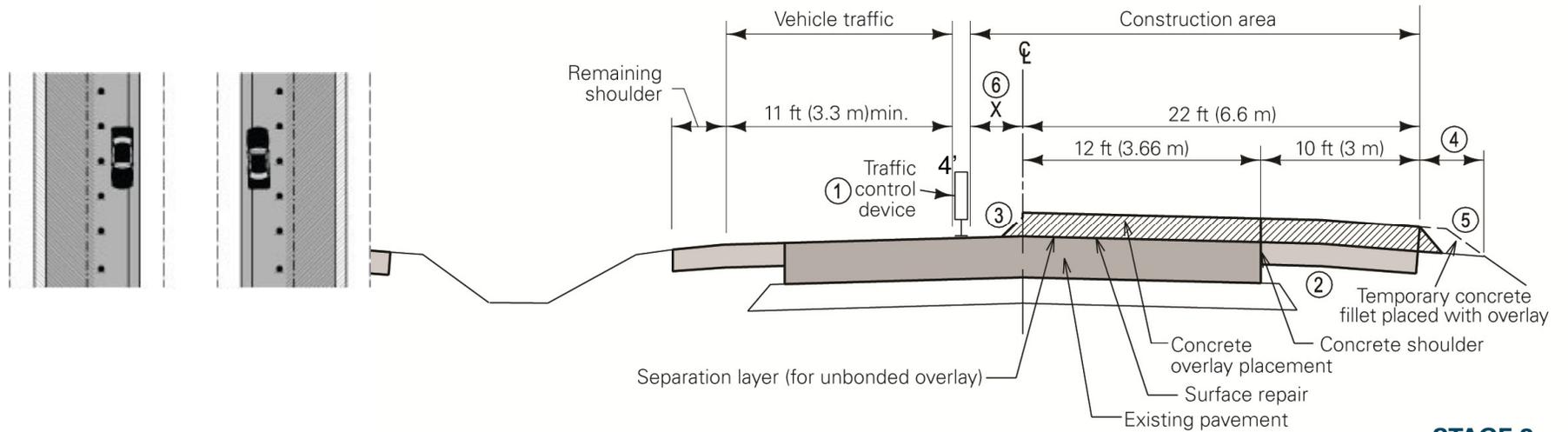
Move traffic and overlay outer lane and shoulder



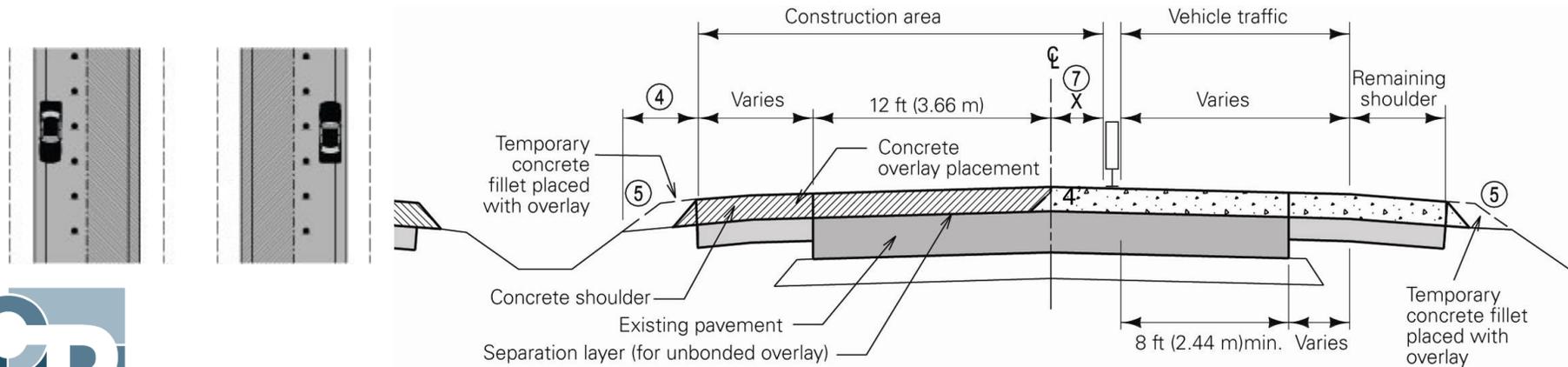
Issues:

1. Construction on both sides
2. Worker safety
3. Clearances to traffic
4. Temporary edge fillets
5. Material delivery

Four Lane Roadway with Paved Shoulders (Using a Conventional Paver)



STAGE 2



STAGE 3

Concrete Overlay Construction, 2 Lanes - Open or Closed to Traffic?

- A common misperception is that concrete overlay construction on two-lane roadways requires road closures
- Partial or completely closing a work zone to traffic can help minimize traffic management costs.
- Projects closed to traffic can save time and cost of 25% to 35%.
- The contract documents should clearly state that the contractor is responsible for maintaining local access for residents and businesses.
- Putting the onus on the contractor yet allowing flexibility in their methods for providing local access is a preferred strategy



Considerations for 2 Lane Overlay Constructed Under Traffic

- Less lateral space available during this operation
 - Float operator, inspector, and paver crew need to fit within the new edge of slab and the edge line



- Delivery vehicles must move in and out of traffic
- Ride quality.....more difficult to obtain consistency
- More time for traffic to get thru project (while paving)
- Edge drop factors (center and outside edge)
 - Motorists may not be aware of dropoffs
 - Height of overlay adds to steepness of the pre-existing side slope

Considerations for 2 Lane Overlay Constructed Under Traffic

- Typically traffic control zones are kept to 0.25 mile (0.4 km) in length without the use of a pilot car
- In rural areas it is more feasible to pave longer sections, so a pilot car and flaggers are often used (2.5 to 3.5 miles)
- Other traffic control measures including flaggers and traffic control signals may be warranted according to jurisdictional requirements



2 Lane Roadway – Example Cost Comparison

Example of cost savings realized with traffic closure

- Highway overlay project, 2012.
 - 4.5” thick concrete and asphalt on 2 lane project
 - Each project was 8.5 miles long, same highway
 - Constructed same year; paving costs approximately equal
 - Asphalt overlay constructed under traffic: \$3,410,000
 - Concrete overlay closed to traffic: \$2,521,000
- Savings: \$ 889,000
- The 35% cost savings was mainly due to a reduction in traffic control operations



Public Awareness



Traffic Alerts

- Temporary rumble strips
- Used to alert the traveling public of the upcoming work zone



Speed Monitor/ Portable Message Board



- To let the traveling public know their speed as they enter the work zone

Highway Advisory Radio

- This was used to broadcast project information for the example project shown later in presentation



Clearance Issues and Potential Solutions



Clearance Challenges

The primary challenges to maintaining reduced clearances are:

- Equipment Clearances:
 - Physical tracks and frame of the slip-form paving machine
 - Traditional paving controls such as use of a string line
- Adequate working area for workers
- Traffic controls for traffic in adjacent lanes
- Users (vehicles, bicycles, pedestrians, etc.)



Minimum Clearance Zone

- The minimum clearance zone needed for a standard concrete paver is 4 ft. (1.22 m) per machine side:
 - This allows 3 ft. (0.91 m) for the paver track/worker
 - 1 ft. (0.30 m) for paver control string line



Reducing Equipment Clearance

- With adequate planning, required equipment clearances can be significantly reduced in concrete overlay projects and near-zero or zero clearances can be achieved to meet project needs.
- Some paving machine manufacturers have developed special paving machines specifically designed to execute “zero” clearance projects

Zero Clearance does not include the 6 to 8 in. for the paving machine edge form



Paving with Dual Stringlines - 1st Pass



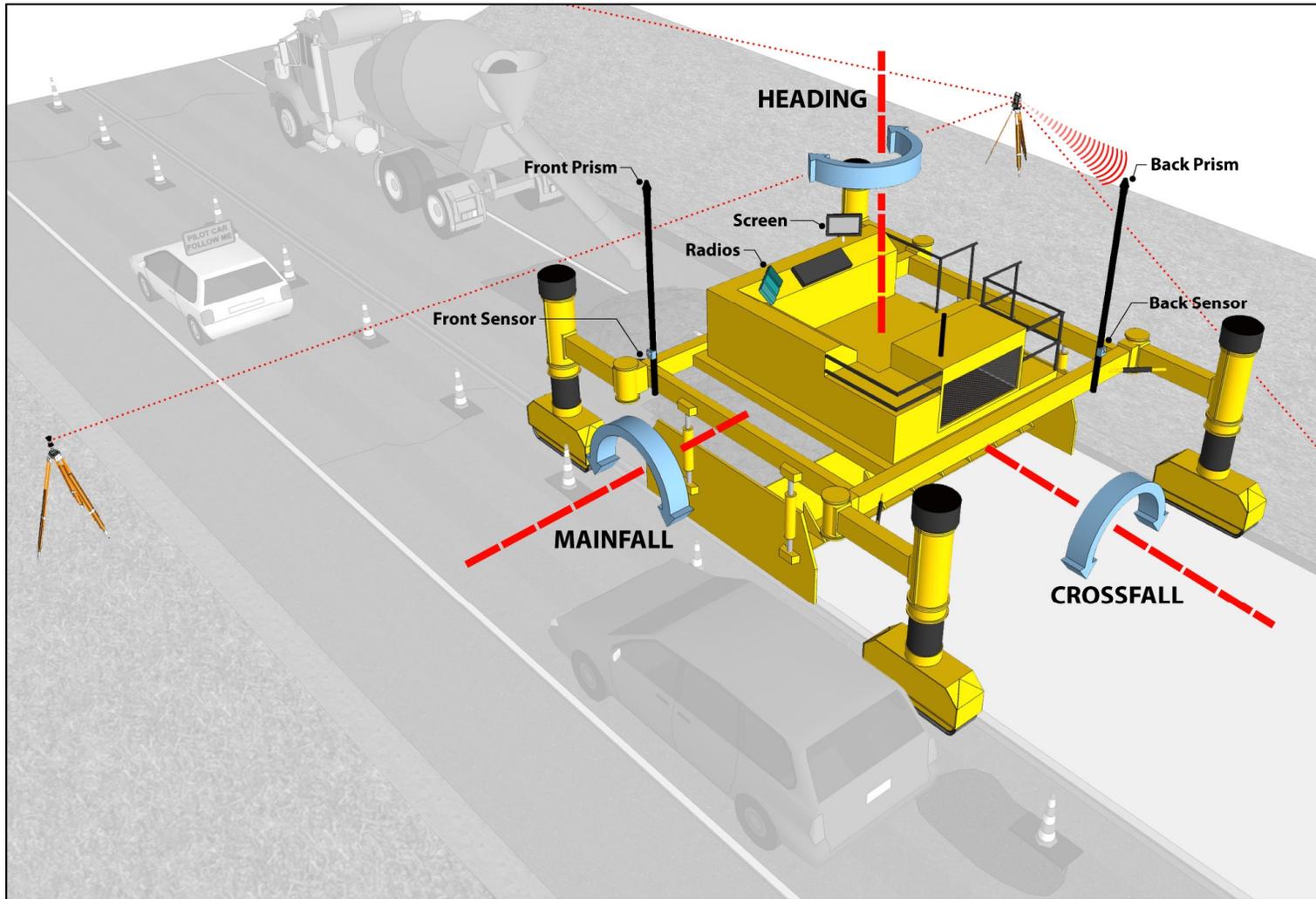
Paving with Outside Edge, Stringline & Ski Combination - 1st Pass



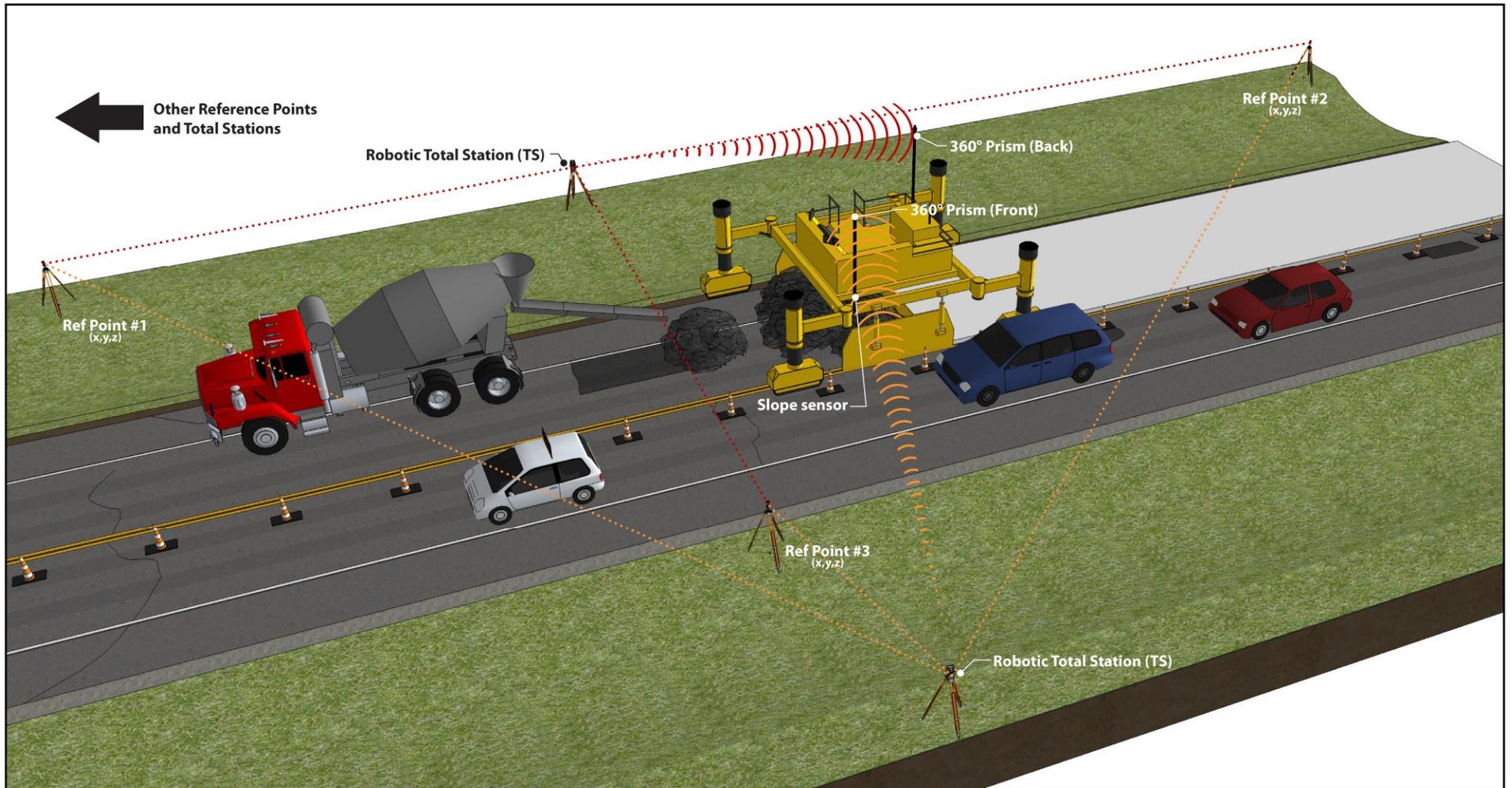
Paver with “Moveable Stringline” or Ski



Stringless Paving



Stringless Paving – 1st Pass



Example of Overlay Constructed Under Traffic



US 18 Bid Information

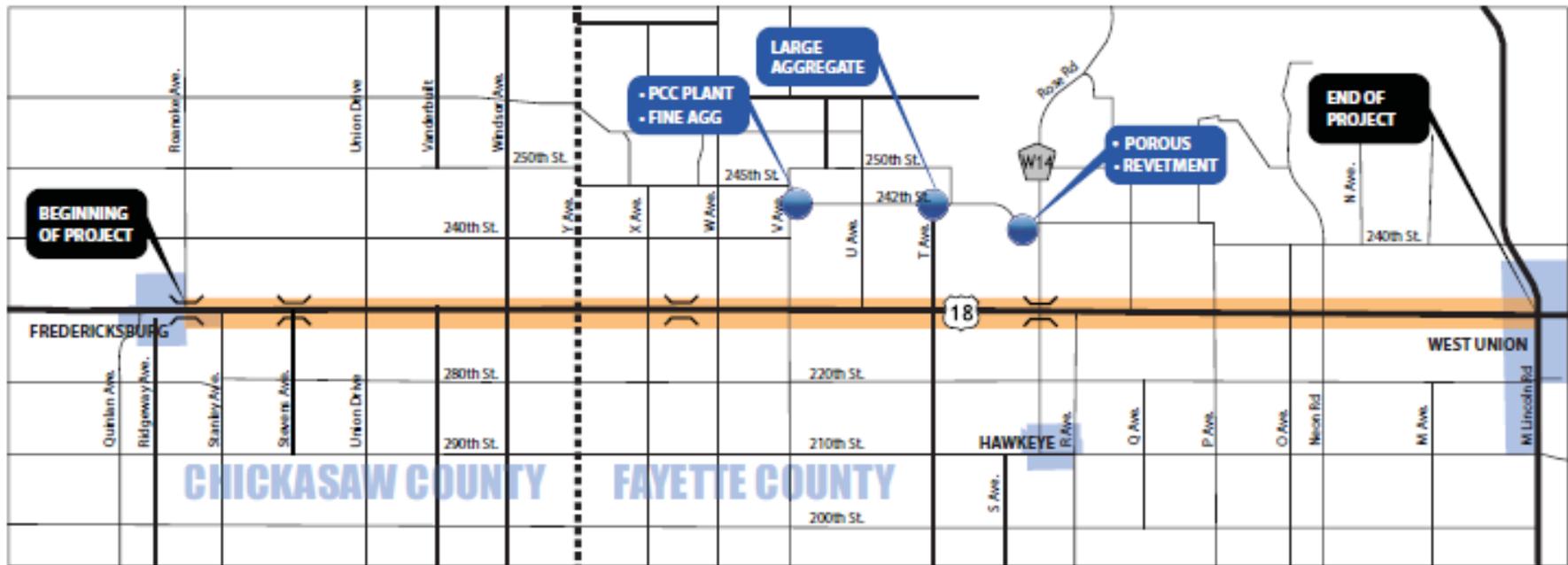
- Bid date – 10/19/2010
- Late start date –April 14, 2011
- Work period – 120 working days
- Limitations – No stringline at centerline
- Project stages – 6 (revised to 5 on site)
- Number of bidders – 6
- Bid range - \$8.48 million to \$10.51 million
- Prime contractor – Manatts Inc.
- Project length – 18.97 miles
- Project current traffic –
 - Chickasaw Co. - 1800 adt/22% trucks
 - Fayette Co. – 3050 adt/13% trucks



US 18 Construction Objectives

- Demonstrate the ability to construct PCC overlays while maintaining traffic on two lane roads
- Identify design and construction features that should be included in plans to:
 - Achieve overlay goals
 - Encourage construction efficiency
 - Reduce construction costs





Paving and Typical Traffic Movement



Stage Work to Meet Both Public and Construction Goals

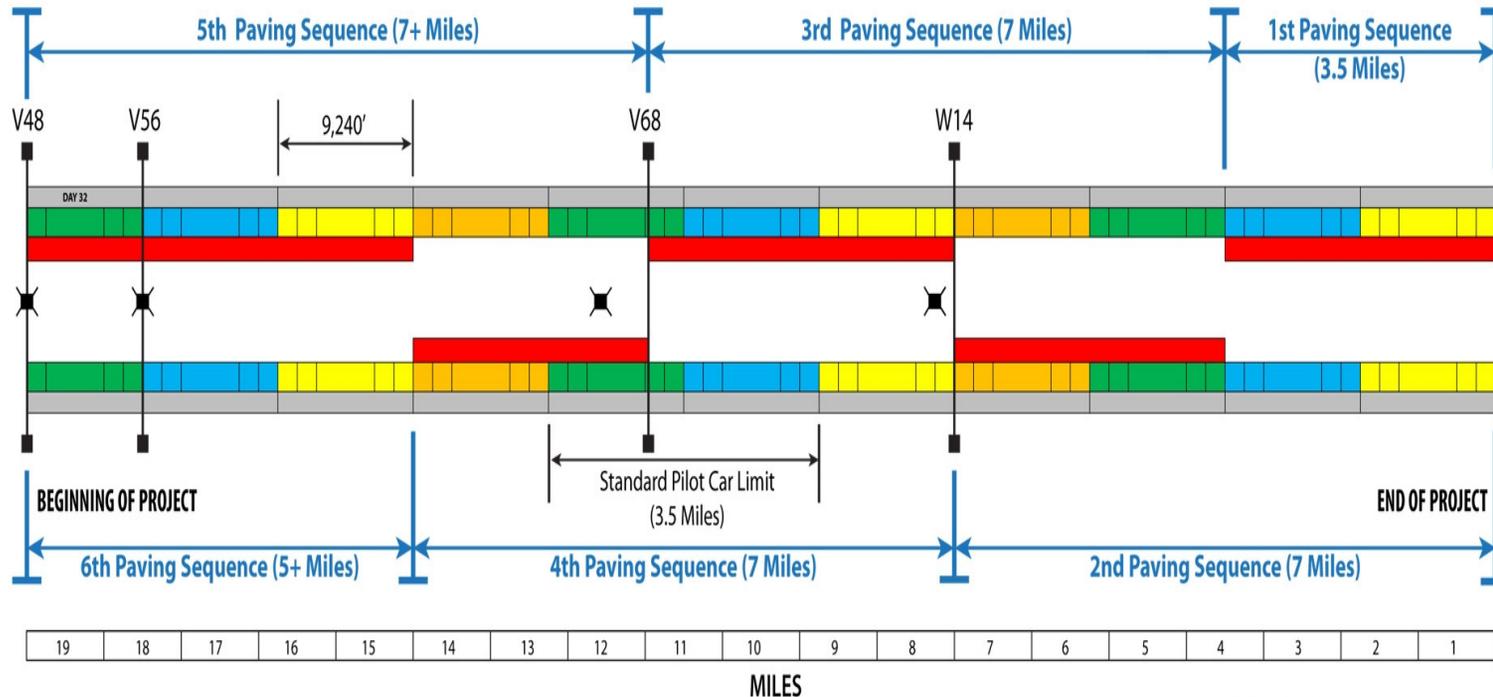
- Maintain through traffic at all times
- Stage I – Prepaving Items (patching, subdrainage, grading & ditches, erosion control, & survey control)
- Stage II – Bridge approaches & paving notches, bridge railing, shoulder strengthening & transitions
- Stage III – Milling and intersection preparation
- Stage IV – Paving, constructing shoulders and pavement marking



US 18 Paving Schedule-Under Traffic

Fredericksburg

West Union



PAVING SEQUENCE EAST TO WEST

Pre-Paving: Milled Trench, Install Steel, Clean Surface
Paving: Pavement and Safety Wedge

GRANULAR SHOULDER
 SAFETY WEDGE □ 0.25 MILE



- With the use of two or more work areas, the paving crew can pave for 5-6 days of every week.
- This allows for good use of equipment, manpower and demonstrates to public the will to accelerate the work.



3.5 Mile Timeline for Opening to Traffic

- 1.0 day- cut trench and lay tied steel
(may include last safety edge)
- 2.5 day- Overlay paving
- 1.5 day- Curing
- 1.0 day- Shoulder construction
- 1.0 day- Striping and signing
- 7.0 days- Open to traffic via pilot car



Traffic Queue Length

- 2 miles – Patching & Milling: 6 to 8 cars / trucks average
- 3.5 miles – Paving: 15+/- cars / trucks average

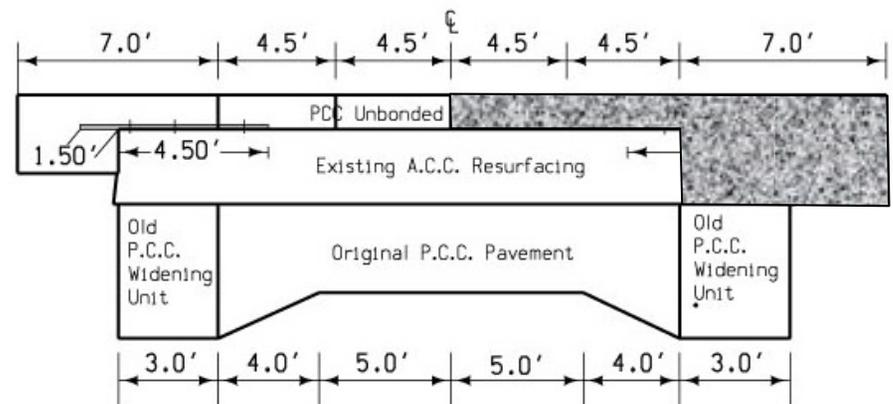


PCC Overlay Paving Operations

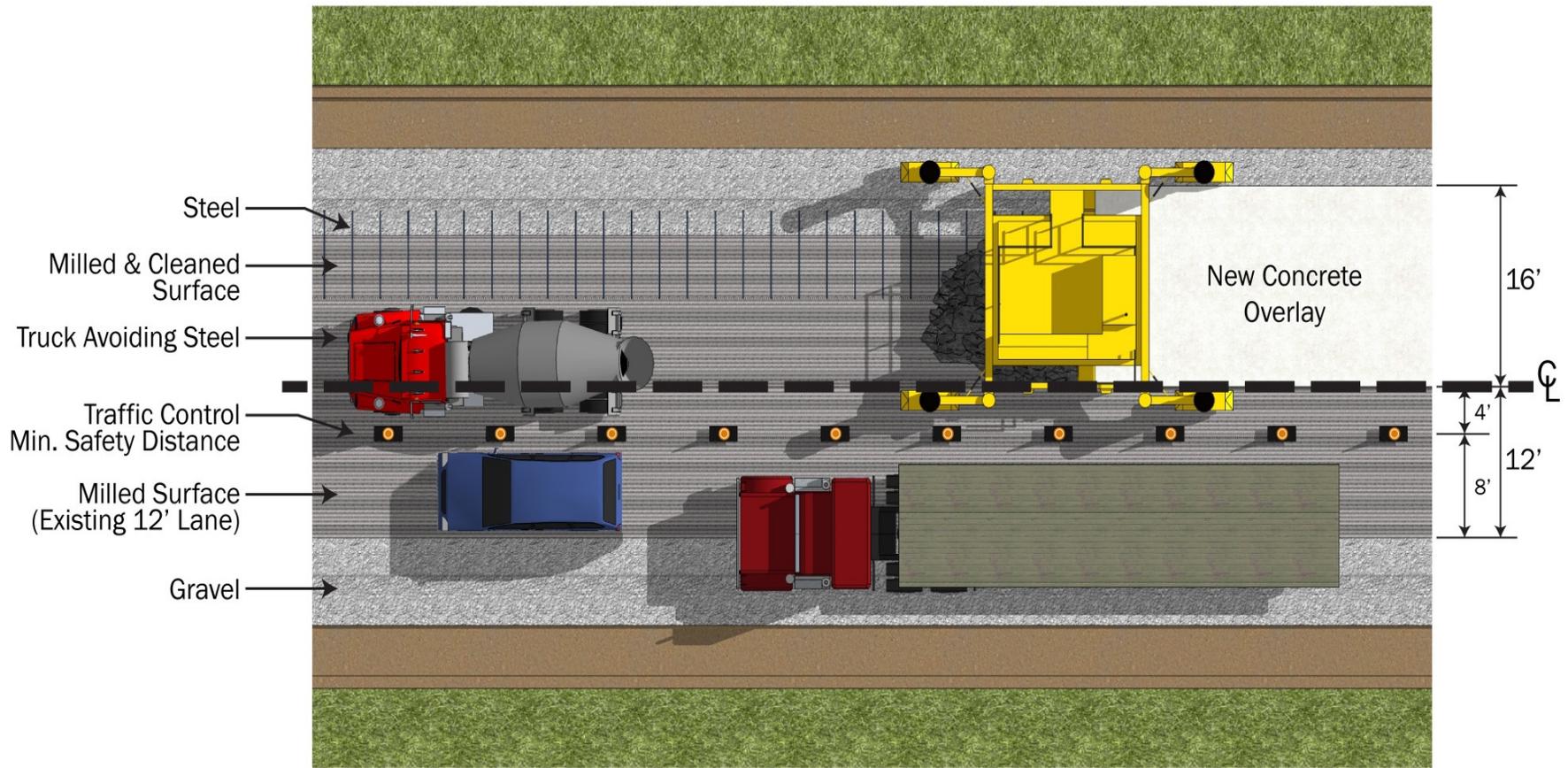
Average paving per day
6,800 to 7,500 ft. (depends
on distance from plant)



Tiebar Placement



Traffic Shift for Tiebars



US18 Bonded Concrete Overlay

Inside Safety Edge Placement



Inside Safety Edge Placement



Inside Safety Edge Placement



Inside Safety Edge Placement Removal



Conclusions

- Concrete overlays are a cost effective and easily constructed alternative to asphalt overlays
- These overlays can be designed for any circumstance and include both bonded and unbonded options
- They can be constructed under traffic, if required,
- Extended curing periods are not required and early opening to traffic is possible
- Traffic flow may be maintained, in most cases, while the overlay is constructed



Thank You!

National Concrete Pavement Technology Center

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