Traffic Management

Guide to Concrete Overlay Solutions

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Traffic Management- Concrete Overlays

Traffic Management for concrete overlay projects is no more challenging than for any other paving project, particularly under traffic, as long as straightforward practices are followed:
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

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
Traffic Management for Concrete Overlay (Work Zones under Traffic)

• Objectives of Work Zone Management
  – Safety
  – Traffic Flow
  – Cost Effectiveness
  – Pavement Performance

• Work Zone Space Considerations

• Paving Clearances

• Traffic Control for contractor & public

• Concrete Overlay Staging – set criteria and let contractor propose solution
Traffic Flow - Concrete Overlays

• “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

• Minimizing disruption to traffic in work zones

• Involving officials and the public during early stages of project planning

• Broadly publicizing the work zone well before construction
Traffic Flows
Key Thresholds

• Volume to Capacity Ratio – greater than .80
  – Impacts on Capacity
    ➢ Close work activity
    ➢ Narrow Lanes
    ➢ Number of Lanes

• Travel Time Delay – less than 10 minutes
  – Speed reduction and length of construction zone

• Level of Service – must be D or better
  – Significant reduction in speed
Work Zone Cost Effectiveness

• Traffic strategies 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
• Agency sets the criteria regarding staging, contractor proposes staging that meets criteria
Concrete Overlays (Closed or Not Closed to Traffic)

• Always analyze the option of closing road where feasible.
• Concrete overlays can be successfully and cost-effectively constructed without closing the roadway to traffic.
• A common misperception is that concrete overlay construction on two-lane roadways requires road closures.
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

Accommodate one lane of traffic each direction

Head to Head Traffic

Issue:
1. Head to Head Traffic
2. Build Crossovers
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 both sides
2. Workers safety
3. Clearances to traffic
4. Temporary edge fillets
5. Material delivery
MUTCD-Channelizing Devices

Temporary Barrier Rail

DRUM
- Facing traffic
- 18 inches MIN.
- 4 to 6 inches
- 36 inches MIN.

TUBULAR MARKERS
- Retroreflective band
- Night and/or freeway High-speed roadway (≥ 45 mph)
- 2 inches
- 3 inches
- 2 to 6 inches
- 3 inches
- 28 inches MIN.
- Day and low-speed roadway (≤ 40 mph)
- 18 inches MIN.
- 3 inches

CONES
- Retroreflective band
- Night and/or freeway High-speed roadway (≥ 45 mph)
- 28 inches MIN. to 36 inches MAX.
- 4 to 6 inches
- 6 inches
- 2 inches
- 4 inches
- 18 inches MIN.
- Day and low-speed roadway (≤ 40 mph)

VERTICAL PANEL
- 8 to 12 inches
- 4 or 6 inches
- 36 inches MIN.
- 12 inches MAX.
Overlay for Four Lane Roadway with Paved Shoulders (Conventional Paver)
2 Lane Roadways-To close or not

Close for Overlay Construction

- Partly 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%.

- Contractor is responsible for maintaining local access for residents and businesses.

- Putting the onus on the contractor allows flexibility in their methods for providing local access is a preferred strategy.
2 Lane Roadways-To close or not Close for Overlay Construction

Example of costs savings with closed overlay project.

- Midwest State Highway Overlay Project 2012.
- 4.5” Thick Concrete and Asphalt on 2 lane project
- Each project 8.5 miles long, same highway
- Constructed same year; paving costs very equal
  - Asphalt Overlay constructed under traffic: $3,410,000
  - Concrete Overlay Closed to Traffic: $2,521,000

Savings: $ 889,000

35% savings was mainly in reduced traffic control
Concrete Overlay Constructed Under Traffic

• When a roadway cannot be closed, higher costs are probably justifiable.

• Possible ways to manage costs include:
  – Where possible, reducing traffic volume through work zones
  – Reducing the frequency and duration of work zones (typically no more than 3 miles).
2 Lane Overlay Construction 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 white edge line

- Batch Truck Movements in and out of traffic
- Ride quality…..harder to obtain high numbers
- Much 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
Two-Lane Highway 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)
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

• Traffic Users (vehicles, bicycles, pedestrians, etc.)
Minimum Clearance Zone

• The clearance zone needed for a standard stringline concrete paver is 4 ft. per machine side:
  - This allows 3 ft. for the paver track/worker
  - 1 ft. or paver control string line
Reducing Clearances

• Do not specify a certain manufacturer’s machine,
  - Define the maximum allowable clearance zone
  - Allow the contractor to innovate his equipment and operation
Reducing Equipment Clearance
New Pavers

Zero Clearance does not include the 6 to 8 in. for the paving machine edge form
Reducing Equipment Clearance
Modified Existing Pavers
Paving with Outside & Inside Stringlines
1\textsuperscript{st} Pass
Paving with Outside Edge Stringline & Ski Combination
1st Pass
Center ACC Milling
Paver Movable Stringline

Paving next to traffic.
Stringless Paving for Centerline for PCC Overlay
Stringless Paving
Stringless Paving for PCC Overlay
Traffic Alerts

Temporary rumble strips
Traffic Queue Length

2 miles – Patching & Milling: 8+ cars / trucks average
3.5 miles – Paving: 15+/- cars / trucks average
Full Depth PCC Patches

- Average 30 per day with sawing in PM
- Equals about mile / day
- Remember difference with bonded and unbonded
Overlay for Two Lane Roadway with Paved Shoulders (Conventional Paver)

Tied Centerline ≥ 6” thick overlays

STAGE 2

STAGE 3
Paving

- Actual Average Paving per day 6,800 to 7,500 ft. (depends on distance from plant)
Night Time Paving

• Example: Concrete overlay on asphalt 2-lane state highways

• Using pilot car during construction

• 24-7 Pilot Car operation

• When not paving:
  - Sawing
  - Shouldering
  - Painting
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- Shouldering
1.0 day- Painting and Signing
7.0 days- Open to traffic via Pilot Car.
Edge Drop Off Fillets

Traffic control device

Full-depth saw cut or fabric or formed gap of 1/4” or more

Overlay

Match existing centerline for overlay on concrete

Unbonded separation layer

Bonded and unbonded overlay 3-4 in. (50-100 mm) thick

Unbonded overlay greater than 4 in. (100 mm)

Saw cut or fabric or formed gap of 1/4” or more

1 in. Min.

T/2 or greater
Inside Safety Edge Placement
Inside Safety Material
Inside Safety Edge Placement Removal
Tiebars Locations
Traffic Shift

- Steel
- Milled & Cleaned Surface
- Truck Avoiding Steel
- Traffic Control Min. Safety Distance
- Milled Surface (Existing 12' Lane)
- Gravel

New Concrete Overlay

US18 Bonded Concrete Overlay
Traffic Management
Construction Quality

Permanent traffic controls in the pavement need to meet design life of the concrete overlay.
Thank You
National Concrete Pavement Technology Center