# Agenda

<table>
<thead>
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<tbody>
<tr>
<td>8:00-8:30</td>
<td>Registration</td>
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<tr>
<td>8:30-8:45</td>
<td>Welcome</td>
<td>Jon Epps – TTI</td>
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<td>8:45-9:00</td>
<td>History of Accelerated Construction</td>
<td>David Newcomb – TTI</td>
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<td>TxDOT’s Interest</td>
<td>Randy Hopmann – TxDOT, ADM</td>
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<td>Project Selection Economics</td>
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<td></td>
<td></td>
<td>Brianne Glover – TTI</td>
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<td>9:50-10:10</td>
<td></td>
<td>Break</td>
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<td>10:10-10:40</td>
<td>Project Development</td>
<td>Tracy Cain – TxDOT, CST</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>Accelerated Bridge Construction</td>
<td>Gregg Freeby – TxDOT, BRG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eddie Reyes – TxDOT, SAT</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>Design Considerations</td>
<td>Andy Naranjo – TxDOT, CST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mike Arellano – TxDOT, AUS</td>
</tr>
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<td>11:20-11:30</td>
<td>Traffic/Safety</td>
<td>Mike Coward – TxDOT, SAT</td>
</tr>
<tr>
<td>11:30-11:40</td>
<td>Public Information</td>
<td>Diann Hodges – TxDOT, CMD</td>
</tr>
<tr>
<td>11:40-12:00</td>
<td>Construction</td>
<td>Johnny Weisman – Hunter Industries, Ltd.</td>
</tr>
<tr>
<td>12:00-12:45</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>12:45-1:00</td>
<td>Charge to Breakout Groups</td>
<td>David Newcomb – TTI</td>
</tr>
<tr>
<td></td>
<td>• A-Pavement Strengthening</td>
<td>Leaders:</td>
</tr>
<tr>
<td></td>
<td>• B-Pavement Widening</td>
<td>A-Victor Vargas – TxDOT, AUS</td>
</tr>
<tr>
<td></td>
<td>• C-Rural Intersection Reconstruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• D-Bridge Widening</td>
<td>B-Lea Jacobson – TxDOT, SAT</td>
</tr>
<tr>
<td></td>
<td>• E-Small Town Main Street</td>
<td>C-Bobby Ramthun – TxDOT, AUS</td>
</tr>
<tr>
<td></td>
<td>• F-Suburban/Rural Widening</td>
<td>D-Jose Mendez – TxDOT, SAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E-Cathy Kratz – TxDOT, AUS</td>
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<tr>
<td></td>
<td></td>
<td>F-Breakout Omitted</td>
</tr>
<tr>
<td>1:00-2:30</td>
<td>Group Discussion of Example Problems</td>
<td>Group Leaders/Recorders – TxDOT</td>
</tr>
<tr>
<td>2:30-3:15</td>
<td>Reports from Groups</td>
<td>Group Recorders – TxDOT</td>
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<td>3:30-3:45</td>
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<td></td>
<td></td>
<td>Tracy Cain – TxDOT, CST</td>
</tr>
<tr>
<td>4:15-4:30</td>
<td>Summary/Adjourn</td>
<td>Jon Epps – TTI</td>
</tr>
</tbody>
</table>
Accelerated Construction

- Welcome
- Definition
- Overview of day
- Overview of topics
- Overview of goals
- Introductions

## Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
<th>Preliminary Design</th>
<th>Environmental</th>
<th>ROW Utilities</th>
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<td>• Utility adjustment</td>
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<td></td>
<td>• Value Engineering</td>
<td></td>
<td></td>
<td>• Misc structures</td>
</tr>
</tbody>
</table>

**Time**

- Letting
- Construction

**Texas A&M Transportation Institute**
Definition of Construction

Greenfield

• Capacity improvement
• Reconstruction
• Rehabilitation
• Major maintenance
• Minor maintenance
Acceleration Goals

**Good**

20 to 0 %

Reduction in time to complete project

**Better**

50 to 20 %
Not All Projects Are Suitable for Accelerated Construction
Workshop Goals

• Information sharing

• Existing TxDOT “tools”

• Identify needed “tools” & “policies”
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<td>Ellis/Glover</td>
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<td>TBD</td>
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<td>Cain</td>
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<td>Freeby/Bettis/Reyes</td>
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<td>Arellano/Naranjo</td>
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<td>Epps</td>
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</table>
ACCELERATED CONSTRUCTION DOCUMENTS

- Briefs
- Implementation Reports
- Presentations

District Workshops on Accelerated Construction

Welcome
AC-PP-17-01
Jon Epps

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017

ACCELERATED CONSTRUCTION BRIEF
Construction Division

AC-B-17-04 ACCELERATED CONSTRUCTION GUIDELINES

BACKGROUND

The use of advanced construction techniques is increasingly being adopted in public works associated with roadway construction and delivery projects. The key objectives of these techniques are to improve project completion time and reduce traffic disruptions and their associated impacts. These disruptions can result in significant cost and time impacts, and in turn affect project schedules.

The use of advanced techniques can result in significant cost savings and improved project schedules. The use of advanced techniques can also result in improved project quality and customer satisfaction.

Project Level Economic Screening Tool

by
Brianne A. Glover, J.D.
David R. Ellis, Ph.D.
Accelerated Construction

TxDOT  Industry
Accelerated Construction

Construction Methods

Traffic Management

Work Zone Safety

Equipment

Materials

Economics

Texas A&M Transportation Institute
Interest in Construction

- Visibility to public
- Safety
- Economics
Introductions
District Workshops on Accelerated Construction
District Workshops on Accelerated Construction
US History
AC-PP-17-02
David Newcomb

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
Accelerated Construction

U.S. History
History

• 1988 – GET-IN STAY – IN: GET-OUT STAY-OUT (NV)
• 1998 – GET-IN STAY – IN: STAY-OUT (CA)
• 1999 – TRB Task Force
• 2000 – Workshop to Define State-of-Practice (DC)
• 2002 – Accelerate Construction Technology Transfer (ACTT)
• 2002 – Workshops for Specific Project (IN) (PA)
• 2003 – Project Pegasus (TX) (IH 30 & IH 35E)
### 1990’s – 2000’s Driving Forces

#### Increasing Demand (1980-2000)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles Miles</td>
<td>+80%</td>
</tr>
<tr>
<td>Drivers</td>
<td>+31%</td>
</tr>
<tr>
<td>Lane Miles</td>
<td>+3.8%</td>
</tr>
</tbody>
</table>

#### Aging System

<table>
<thead>
<tr>
<th>Category</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridges</td>
<td>40% +40 Years Old</td>
</tr>
<tr>
<td>Pavements</td>
<td>Exceeded Design Life</td>
</tr>
</tbody>
</table>

+80% +31% +3.8%
# Accelerated Construction Skill Sets

| • Financing | • Utilities | • Long Life Bridges |
| • Contracting | • ROW | • Long Life Pavements |
| • Work Zone | • Railroad | • Quality Control |
| • Mobility | • Communication /Outreach | • Modular/Prefab Construction |
| • Corridor Improvement | • Training | • Constructability |

• Worker Health & Safety
Peak-Period Congestion on NHS

Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested

2011

2040
Peak-Period Congestion on NHS

Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested

2011

2040
Project Costs by Type, Related to Duration
AR and LA - Rubblization Projects

- 300 Miles of Interstate Concrete Pavement (Decker and Hansen, 2005)
  - Rehabilitation needed
  - Slowest construction operation – demolition and removal
  - Rubblization kept in-place PCC to serve as high-quality base
  - Rate of production for rubblization = 1 lane-mile/day
    (twice the rate for PCC removal (Mn/DOT, 2005)

- Louisiana (Landers, 2011)
  - Used for I-55 (hurricane evac route)
  - Completed in seven months as opposed to 2-3 years for reconstruction
Wilmington, DE – I-95, 2000 (FHWA, 2003)

- $23.5 million - 2 years
- 24.4 lane-miles, 10 interchanges, bridge repairs, drainage improvements, lighting/safety
- AADT = 100,000 vpd (11% Commercial)
- Full road closure (reroute to I-495)
- Rubblilization with asphalt overlay
- SB and NB I-95 closed 3 months each
- $25,000/day bonus for early completion, penalty for delay
- 75% reduction in duration (185 days)
- Detour - overall project costs increased
Maine – I-295, 2008 (Lane, 2009)

- 1970’s JRCP in S. Maine had ASR
- Important tourist route
- Remove top 3” JRCP, rubblize rest
- Full road closure, mid June – end of Aug
- Conventional lane closures = 3 construction seasons
- Traffic detoured on local roads – some improvements
- Incentive/disincentive up to $2 million
- Work completed 20 days ahead of schedule
- Contractor used up to 5 paving crews at once on project
California I-15, (Anderson et al., 2005)

• Rebuild I-15
• Used 96-hr closures
• Compressed work from 8.5 months to 6 weeks
• Had contingencies for brush fires, weather, congestion, material shortage, etc.
• Selective use of rapid-curing cement
• Contractor flexibility – key to success
Austin Lamar Blvd. (Anderson et al. 2005)

• Complex project involving utilities
• Prequalified bidders
• Req’d 12-hr days, 7 d/wk (14 on/2off)
• 3 milestones with up to $120k bonus for each
• Penalty - $20k/day
• Urban area – intersections on weekend, noise mitigation at night
• PR campaign was successful
Summary

• Accelerated construction not new
• Requires
  ▪ Right application
  ▪ Incentives/disincentives
  ▪ Recognition of and planning for risks
  ▪ Flexibility on part of agency and contractor
  ▪ Innovative thinking
  ▪ Public engagement
• Will become more standard with time
Things Will Not Become Simple!

(a) Year 2011

(b) Year 2040

Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested
TxDOT Interest in Accelerated Construction

AC-PP-17-03

Randy Hopmann

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
Outline

• Background
• Texas Landscape
• Texas History
• Opportunities
• Workshop Outcomes
## Project Delivery

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- **Letting**
- **Construction**

**Texas A&M Transportation Institute**
## Economic Considerations - Examples

<table>
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<tr>
<th>Project</th>
<th>Per Month Costs</th>
<th>Project Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widen FM road from 2-lanes to 4-lanes (2.7 miles)</td>
<td>$ 96,000</td>
<td>$ 3.5M</td>
</tr>
<tr>
<td>Widen Freeway (2.6 miles)</td>
<td>$297,000</td>
<td>$17.8M</td>
</tr>
<tr>
<td>Interchange in urban area (1.5 miles)</td>
<td>$447,000</td>
<td>$ 5.1M</td>
</tr>
</tbody>
</table>
Acceleration Goals

Good

Construction time

20 to 0%

reduction in time to complete project

Better

Construction time

50 to 20%
Economic Considerations - Stakeholders

- **Agency**
  - Extra engineering costs
  - Extra management
  - Price escalation
  - Safety

- **Public**
  - Time
  - Fuel
  - Vehicle Damage
  - Safety

- **Contractor**
  - Unproductive labor/equipment
  - Material inventory
  - Insurance/bonding capacity
  - Safety
Economic Consideration

• Direct project costs
  ▪ Agency
  ▪ Some contractor

• Indirect project costs (user/non-user)
  ▪ User fuel/time
  ▪ Roadside businesses
  ▪ Business efficiency (timely delivery)
  ▪ Some Contractor

All costs eventually borne by the public
Safety & Economics

• Reduce time traffic in work zone
• Traffic not in work zone
• Reduce user delay costs
  ▪ Fuel
  ▪ Time
• Vehicle maintenance
• User cost savings exceed construction costs
Reduce Construction Time

• Contracting methods
  ▪ Design/Bid/Build
  ▪ Cost-Plus Time (A+B)
  ▪ Interim completion dates
  ▪ No-excuses incentives
  ▪ Construction manager at risk
  ▪ Design/Build

• Lane occupancy time
  ▪ Off peak traffic
    • Day
    • Night
  ▪ Long weekend closures
  ▪ Close facility
Reduce Construction Time

- Bridges/Culverts (ABC)
- Pavements
Not for every project
Outline

• Background
• **Texas Landscape**
• Texas History
• Opportunities
• Workshop Outcomes
2017 Unified Transportation Program (UTP)

2017–2026
Transportation Planning & Programming
We Build Texas

Field Guide to
Successful Project Delivery

We build Texas – Safely
We build Texas – Quality
We build Texas – On Time
We build Texas – Together

Working together to successfully deliver projects.

Texas Department of Transportation

Associated General Contractors of Texas
Outline

• Background
• Texas Landscape
• **Texas History**
• Opportunities
• Workshop Outcomes
• 1998 – Heald
  - Legislators – TxDOT & User Costs for Liquidated Damage
  - Commission – Reduce Construction Time
  - Incentives/disincentives

• 2001 – Johnson’s “Transportation Working Group”
  - Reduce project delivery time by 15% by 2006
  - Address cost of disruption of traffic

• 2002 – Saenz
  - Accelerated construction – Businesses & traffic flow impacted
  - Calendar day definition of working day
  - Milestones for incentives/disincentives
  - Lane rental
  - A+B
• 2003 – “Accelerated Construction Strategies Guidelines”

• 2004 – Saenz
  ▪ Use accelerated construction on
    • High traffic locations
    • Significant impact on safety or businesses
    • Other project specific reasons

• 2009 – Bohuslav – AASHTO Scan Tour
Katy Freeway (IH-10)

- Traditional construction – 12 years
- Accelerated construction – 6 years
Katy Freeway (IH-10)

- 23 miles
- 280,000 VPD
- $2.6 billion (2/3 construction)
- 6 years vs 12 years
Katy Freeway Economics

- $150 - $200 million/year
- Accelerated construction benefit - $2.8 billion
- Cost of accelerated construction - $309 million
- B/C ratio – 9.0
Outline

• Background
• Texas Landscape
• Texas History
• **Opportunities**
• Workshop Outcomes
Materials

- Strength gain (time, temp)
- Removal
- Production
- Transportation
- Placement
Equipment

- Materials handling
- Demand for equipment
- Prototype/production unit/redesign
- Cost
Process Control/Quality Control

• High production/placement rates
• Rapid tests
• Quick feedback to produce quality
• Management to insure quality
Traffic Control

- Place/remove quickly
- Moving construction zone
- Protect driver/contractor workforce
Workforce

• Skill set
  ▪ New equipment
  ▪ New materials
  ▪ QC/QA

• Congested work zone

• Shift length

• Housing/facilities
• Personal life
• Management team
• Financial
Economic Incentives - Contractor

• One job/occasional job
• Return on investment (equipment)
• Bonding capacity
• Backlog of work
• Risk
Key Items

• Project selection & planning
• Contracting methods
• Design - Simpler design = faster construction
• Contractor selection
• Construction considerations
Planned Accelerated Construction

- TxDOT champion
- TxDOT/FHWA support team available
- Vision – goals & objectives
- Policies & procedures
- Partnering
- Alternative contracting methods
- Cultural change
Planned Accelerated Construction (Cont’d)

- New technologies
- Total costs – Agency, construction, user, non-user, safety environmental
- Engage construction & materials industries
- Performance measures
- Learn from past & improve
Keys to Accelerated Construction

• Consider accelerated construction in planning stage
• Isolate construction work from traffic
• Reuse existing materials on site
• Maintain lane closure as long as possible
• Innovative approaches to traffic handling
Workshop Goals

• Information sharing

• Existing TxDOT “tools”

• Identify needed “tools” & “policies”
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
District Workshops on Accelerated Construction
Economic Screening Tools
AC-PP-17-04
David Ellis
Brianne Glover

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
• Benefit-Cost tool

• Focus – road user costs and economic losses

Economic Impact
Project Level Economic Screening Tool

Inputs

• Traffic Data
• Geographic Location
• Cost to Accelerate Construction
• Project Timing
• Construction Segments
• Adjacent Retail Businesses
Project Level Economic Screening Tool

- **Urban**
  - Major metropolitan and urban areas

- **Suburban**
  - Areas adjacent to major metropolitan and urban areas

- **Rural**
  - Areas outside of urban and suburban areas
## Preconstruction Conditions

<table>
<thead>
<tr>
<th>Project Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Operating Speed</td>
<td>50</td>
</tr>
<tr>
<td>Segment Length (miles)</td>
<td>6.0</td>
</tr>
<tr>
<td>Pre Construction ADT</td>
<td>215,000</td>
</tr>
<tr>
<td>Percent Trucks</td>
<td>15%</td>
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<tr>
<td>Project Region</td>
<td>Urban</td>
</tr>
<tr>
<td>Retail (SQFT)</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Travel Time per Trip (minutes)</td>
<td>7.2</td>
</tr>
</tbody>
</table>

**NOTE:** There can be significant variation in economic impact due to the type of business as well as type of area (urban, suburban and rural). For the purposes of this model retail sales per square foot was used as the default method of calculation. Further, while the model has three different area types from which to choose, even within those area types, there can be significant variation in sales per square foot depending on the specific location. In terms of economic impact, this model provides general guidance only.

<table>
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</tr>
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<tbody>
<tr>
<td>Total Project Period (calendar days)</td>
<td>900</td>
</tr>
<tr>
<td>Percent of ADT that is Traveling During Peak Periods</td>
<td>75%</td>
</tr>
</tbody>
</table>

### Traditional Construction Scenario

<table>
<thead>
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</tr>
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<tbody>
<tr>
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</tr>
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</tr>
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### Accelerated Construction Parameters

<table>
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<tbody>
<tr>
<td>Added Cost of Accelerate Construction</td>
</tr>
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<table>
<thead>
<tr>
<th>Accelerated Construction Scenario</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Travel Time Value</td>
<td>$134,574,816</td>
</tr>
<tr>
<td>Truck Travel Time Value</td>
<td>$41,455,517</td>
</tr>
<tr>
<td><strong>Total Travel Time Value</strong></td>
<td><strong>$176,030,333</strong></td>
</tr>
<tr>
<td>Automobile Operating Cost</td>
<td>$40,262,384</td>
</tr>
<tr>
<td>Truck Operating Cost</td>
<td>$31,867,128</td>
</tr>
<tr>
<td><strong>Total Operating Cost</strong></td>
<td><strong>$72,129,512</strong></td>
</tr>
</tbody>
</table>
### Preconstruction Conditions

<table>
<thead>
<tr>
<th>Project Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Operating Speed</td>
<td>50</td>
</tr>
<tr>
<td>Segment Length (miles)</td>
<td>6.0</td>
</tr>
<tr>
<td>Pre Construction ADT</td>
<td>215,000</td>
</tr>
<tr>
<td>Percent Trucks</td>
<td>15%</td>
</tr>
<tr>
<td>Project Region</td>
<td>Urban</td>
</tr>
<tr>
<td>Retail (SQFT)</td>
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## Preconstruction Conditions

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<tr>
<td>Retail (SQFT)</td>
<td>2,000,000</td>
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<tr>
<td>Travel Time per Trip (minutes)</td>
<td>7.2</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Accelerated Construction Parameters</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Added Cost of Accelerated Construction</td>
<td>$200,000,000</td>
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<tr>
<td>Added Cost of Incentives</td>
<td></td>
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<tr>
<td>Total Project Period (calendar days)</td>
<td>365</td>
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<tr>
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<td>75%</td>
</tr>
</tbody>
</table>
## Project Level Economic Screening Tool

### Construction Conditions

<table>
<thead>
<tr>
<th>Segment 1</th>
<th>Segment 2</th>
<th>Segment 3</th>
<th>Segment 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional Construction Parameters</strong></td>
<td><strong>Values</strong></td>
<td><strong>Acceleration Construction Parameters</strong></td>
<td><strong>Values</strong></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td>180</td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
<td>3</td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td>10</td>
<td>Average Operating Speed (Peak)</td>
<td>10</td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td>45</td>
<td>Average Operating Speed (Off-Peak)</td>
<td>45</td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td>20%</td>
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</tr>
</tbody>
</table>

---

- **Texas A&M Transportation Institute**
<table>
<thead>
<tr>
<th></th>
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<th>Accelerated Construction Parameters</th>
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<tbody>
<tr>
<td><strong>Segment 1</strong></td>
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<th>Values</th>
<th>Accelerated Construction Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segment 2</strong></td>
<td></td>
<td><strong>Segment 2</strong></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td>185</td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
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<td>20%</td>
</tr>
</tbody>
</table>
Economic Loss

- Sales
- State Sales Tax Revenue
- Local Sales Tax Revenue
<table>
<thead>
<tr>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional Construction Tools</strong></td>
</tr>
<tr>
<td>Total Road User Costs and Economic Loss</td>
</tr>
<tr>
<td>$1,832,284,439</td>
</tr>
<tr>
<td><strong>Accelerated Construction Tools</strong></td>
</tr>
<tr>
<td>Total Road User Costs and Economic Loss</td>
</tr>
<tr>
<td>$ 771,059,803</td>
</tr>
<tr>
<td><strong>Traditional vs Accelerated</strong></td>
</tr>
<tr>
<td>Change in Road User Costs and Economic Loss</td>
</tr>
<tr>
<td>$1,061,224,636</td>
</tr>
<tr>
<td>Road User Cost and Economic Daily Cost</td>
</tr>
<tr>
<td>$ 1,983,597</td>
</tr>
<tr>
<td>B/C of Accelerated construction</td>
</tr>
<tr>
<td>5.31</td>
</tr>
</tbody>
</table>

13
Estimated User Costs and Economic Losses

- **Traditional**: $1,832,284,439
  - Travel Time Value
  - Operating Costs
  - Loss of Sales
  - Loss of Tax Revenue
  - Cost to Accelerate

- **Accelerated**: $771,059,803
  - Travel Time Value
  - Operating Costs
  - Loss of Sales
  - Loss of Tax Revenue
  - Cost to Accelerate

Estimated User Costs and Economic Losses
District Workshops on Accelerated Construction

Contacts

Brianne Glover  b-glover@tamu.edu
David Ellis  d-ellis@tamu.edu

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
District Workshops on Accelerated Construction Project Development
AC-PP-17-05
Tracy Cain

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
OUTLINE

• Project Selection and Planning
• Contracting Methods
• Design
• Contractor Selection
• Involvement of Contractor
• Construction Considerations
• Project Development Process Manual-2017
• Bridge Project Development Manual-2016
• PS&E Preparation Manual-2016
• Roadway Design Manual-2014
• Bridge Design Manual-2015
• Bridge Detailing Guide-2016
• Pavement Design Manual-2011
• Hydraulic Design Manual-2016
• Texas Manual on Uniform Traffic Control Devices -2014
• Accelerated Construction Strategies Guidelines – (Under Revision)
PROJECT SELECTION & PLANNING

• General Guides
• Economic Considerations
• ROW, Utilities, Environmental & Railroads
• Risk Assessment
• Public Information
• Other
General Guidelines

• FHWA
  • High Traffic - generally urban areas
  • Complete a “gap” in a highway system
  • Major project that will disrupt traffic
  • Major bridges out of service
  • Lengthy detour required
General Guidelines

• TxDOT-2003
  • Interstates with lane closures
  • Bridge closure
  • Road closure
  • Added capacity project
  • Non-freeway with ADT>10,000 & lane closures
  • Restrict access to schools, emergency services, etc.
  • Affect adjacent businesses
General Guidelines

• Rural areas
  • Impact on small towns traffic flow
  • Impact on small town businesses
  • Intersections

• Key transportation routes for major industries
  • Energy development
  • Agriculture
  • Mining
Economic Considerations

• Agency Administrative Costs
• Road User Costs
• Non-User Costs (adjacent businesses)
• Construction Costs
• Contractor Management Costs
Calculation Tools

• TxDOT Road User Cost Calculator

• Project Level Economic Screening Tool
PROJECT SELECTION & PLANNING

- ROW
- Utilities
- Environmental
- Historical Preservation
- Archeology
- Railroad
Public Information

• Early and often

• Involve public during planning stages

• Short term inconvenience for long term convenience

• Use of coordinator
Contracting Methods

TxDOT Guides

• Calendar day definition for working day
• Incentive Using
  • Contract administration liquidated damages
  • Road user costs
• Milestones with Incentives/Disincentives
• Substantial Completion Incentives/Disincentives
• Lane Rental Disincentive
• A+B Provisions
• Design-Build
Selection of Contracting Method

• Influencing factors in selection of method
  • Project size
  • Project type- new construction, rehabilitation, etc.
  • Project complexity
  • Critical completion time
Contracting Methods

A+B Contracting

• A - Traditional bid for the unit prices multiplied by the contract quantities
• B - Time to complete the project x daily road user costs
• Road user costs provided by TxDOT
• Contract state minimum and maximum work days
• Contractors bids “time” is the “time” used for contract cost adjustments
DESIGN

• General Considerations
• Geometric Design
• Bridge Design
• Drainage Design
• Pavement Design
• Roadside Safety Design
• Traffic Control and Job Sequencing
• Project Duration
Traffic Control and Job Sequencing

- Texas Manual on Uniform Traffic Control Devices
- Deployment and removal time for traffic control devices
- Design for safety (speed if possible as public will push the speed limits)
- Constructability review
CONTRACTOR SELECTION

TxDOT Prequalification

• Confidential Questionnaire
  • Audited financial statement
  • Completion of questionnaire

• Bidder’s Questionnaire
  • Confidential questionnaire waived
  • Smaller projects, routine maintenance, emergency, specialty projects
Contractor Selection

Possible Future Considerations

• Quality
• Past performance
• Safety
• Special technical capabilities
• Key personnel
Involvement of Contractor

• Planning and Design Reviews
• Partnering
• Workforce
IN VolvEMENT OF CONTRACTOR

Planning and Design Reviews

• More early and detailed reviews by TxDOT
• Provide state wide resource of experienced engineers, etc.
• Include contractors, materials suppliers, fabricators, equipment manufacturers, transportation companies
Partnersing

- Agreement to
  - Solve issues at low level in organizations
  - Openness to change as information becomes available
  - Attention to detail
  - Focus on project with unselfish effort
  - Take steps to insure that no interruptions take place
  - Co-locate key personnel on project
  - Empower workforce to make immediate decisions
  - Technical expertise on job site or immediately available
  - Include all stakeholders-TxDOT, contractors, materials suppliers, fabricators, local governments, utility companies, trucking companies
Workforce
• Extended hours
• Rapid pace
• Worker fatigue
• Redundant critical personnel
• Hand-off work between shifts
• Equipment maintenance
CONSTRUCTION CONSIDERATIONS

- General Considerations
- Work Plan and Work Sequence
- Workforce
- Work Space
- Equipment
- Quality Control/Quality Assurance
- Information Exchange
CONSTRUCTION CONSIDERATIONS

General Considerations

• “We Build Texas-Field Guide to Successful Project Delivery”

• Key elements of successful project
  • Safety
  • Money
  • Timeliness
  • Relationships
  • Perception
  • Quality

We Build Texas
Field Guide to
Successful Project Delivery
General Considerations

• Activities that produce successful project
  • Contract Relationships
  • Activities Prior to Letting
  • Post-Letting to Contractor Start Activities
  • Construction Start to Contract Completion Activities
CONSTRUCTION CONSIDERATIONS

• Work Plan and Work Sequence
• Workforce
• Workspace
• Equipment
• QC/QA
• Information Exchange
Summary

- Project Selection and Planning
- Contracting Methods
- Design
- Contractor Selection
- Involvement of Contractor
- Construction Considerations
District Workshops on Accelerated Construction

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
ACCELERATED BRIDGE CONSTRUCTION IN TEXAS (AND BEYOND)

Gregg Freeby – Bridge Division
Eddie Reyes – San Antonio District
Accelerated Bridge Construction (ABC) Techniques

1. Prefabricated Elements
2. Self Propelled Modular Transporters (SPMTS)
3. Modular Units
4. Lateral Slide-in Bridge Construction-Single Shaft Foundations

Photo Courtesy of FHWA
Prefabricated Elements

- TxDOT’s primary technique for accelerated bridge construction.
- In addition to increased speed, also typically comes with increased quality.
- Can encompass practically every element from the ground up.
Precast Bent Caps
Precast Abutments

![Images of precast abutments being constructed and lifted with cranes.]
Precast Columns
TxDOT’s Bread & Butter: Girders and Deck Panels
Moving Forward

- Prefabricated elements are largely what make TxDOT bridges the least expensive and most durable in the country. Keep it up!

- Prefabricated elements typically speed up construction considerably, but typically do not really constitute “Accelerated Bridge Construction.”

- Now let's talk fast!
Decked Slab Beams: 6 – 10 Day Construction Projects

- Precast Abutment
- Decked Slab Beams
- Precast Bent Cap
- Steel Piling
Full Width, Full Depth Panels
Full Width, Full Depth Panels – Upcoming Waco Project
Self Propelled Modular Transporters (SPMT)

Photos Courtesy of Heavy Equipment Guide
SPMT – Fort Worth West 7th Street Arches
Modular Units
Modular Units – I-93 Fast 14 in Boston
Modular Units – I-93 Fast 14 in Boston

New Bearing Seat
Existing Cap
Modular Units (No Deck) – West Dallas St. in Houston
Modular Units – West Dallas St. in Houston
Modular Units – West Dallas St. in Houston
Lateral Slide-in – LP 345 (San Antonio)
Lateral Slide-in – LP 345 (San Antonio)
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Lateral Slide-in – LP 345 (San Antonio)
Footing Construction LP1604 (San Antonio)
120” Drill Shaft–LP 410 (San Antonio)
120” Drill Shaft- LP410 (San Antonio)
120” Drill Shaft- LP410 (San Antonio)
QUESTIONS?

Gregg Freeby – Bridge Division
Eddie Reyes – San Antonio District
Entities or individuals that copy and present state agency information must identify the source of the content, including the date the content was copied. Entities or individuals that copy and present state agency information on their websites must accompany that information with a statement that neither the entity or individual nor the information, as it is presented on its website, is endorsed by the State of Texas or any state agency. To protect the intellectual property of state agencies, copied information must reflect the copyright, trademark, service mark, or other intellectual property rights of the state agency whose protected information is being used by the entity or individual. Entities or individuals may not copy, reproduce, distribute, publish, or transmit, in any way this content for commercial purposes. This presentation is distributed without profit and is being made available solely for educational purposes. The use of any copyrighted material included in this presentation is intended to be a “fair use” of such material as provided for in Title 17 U.S.C. Section 107 of the U.S. Copyright Law.
ACCELERATED CONSTRUCTION WORKSHOP

Austin – San Antonio Districts
August 1, 2017
ACCELERATED PAVEMENT CONSTRUCTION

Andy Naranjo, P.E.
CST M&P – Rigid Pavement Branch Mgr.
Precast Concrete Pavement Background

- PCP is a recent technology – in use since 2001 (Started in Texas)
- Used primarily for RAPID repair & rehabilitation & longer-lasting treatments
  - Panels fabricated off-site, transported to project site & installed on a prepared foundation
  - Only minimal field curing time required
- Typically, night-time work & short work windows
- Typically, repair/rehab along a single lane
  - Multiple-lane repair/rehab possible based on site constraints
What Applications Have Precast Pavements Been Used In?

- **Primary Applications (90%+ use)**
  - Heavily-traveled main line interstate/primary system & urban roadways
  - Interstate/primary system & urban ramps - Often no alternative routes and heavy traffic

- **Special Applications**
  - Intersections - Where traffic needs to be maintained
  - Bridge approach slabs - A large no. of approach slabs across country need to be rehabilitated under traffic
  - Underpasses - Where height restrictions may limit rehab options
  - Bus pads - Where alternative bus stop locations are not acceptable, bus pads can be replaced overnight
  - Airfield Applications - A developing market
  - Utility “bridges” - Over failed drainage pipes & culverts
It All Started in Texas!

- I-35 frontage rd in Georgetown, TX
- Built in 2001
- Pre-stressed/post-tensioned panels
- Full-road-width and half-road-width panels
- Section still performing well.
Recent Project: SH97/SH72 Intersection (2016)
ACCELERATED PAVEMENT CONSTRUCTION

Mike Arellano, P.E.
Austin District – Director of Maintenance
US 183 to Lady Bird Lake is the most congested and constrained portions of the I-35 corridor
  – #10 in the Nation
  – #2 in Texas

Strategic portion of IH-35 corridor
  – Major freight corridor
  – State legislature & agencies
  – Federal agencies
  – Trauma Hospitals
  – City of Austin offices
  – University of Texas
Primary Goals are:

- To objectively analyze the fastest means to construct pavement structures
- To preventing future closures due to maintenance by designing for a performance life of >30 years.

Bottom line: Low pain tolerance for extended closures or restriction to traffic flow (No alternate routes or little ROW)

In other words...Get in, Get Out Quickly, and Stay out.
Mobility35 Pavement Alternatives Study: Overview and Objectives

- Study pavement alternatives
  - Full-depth HMA
  - CRCP
  - Precast Concrete Pavement (PCP)
- Provide recommendations for four key segments (Schematic Level)
  - Segment 1: US 183 to US 290E
  - Segment 2: US 290E to Airport Blvd.
  - Segment 3: Airport Blvd. to MLK Jr. Blvd.
  - Segment 4: MLK Jr. Blvd. to Lady Bird Lake
Mobility35 Pavement Alternatives Study: Analysis Approach

- Pavement alternatives analysis approach
  - Data collection (GPR, FWD, Cores, As-Builts, etc...)
    - Assessing disposition of existing pavement
  - Pavement design for three pavement types
    - HMA, CRCP, Precast Concrete Pavement
  - Life-cycle cost analysis
    - Economic analysis of pavement alternatives
  - Constructability evaluation
    - Addressing constructability challenges
PAVEMENT ALTERNATIVES
SEGMENT 3 EXAMPLE

Airport Blvd. to MLK Jr. Blvd.
Segment 3: Overview

- Approx. 1.54 centerline miles (between Airport Rd. bridge and MLK Jr. overpass)
- Includes lower decks and short section south of upper/lower deck split (upper decks not analyzed)
- Majority of segment on tangent with a ~4,500 ft. radius curve near MLK Jr. Blvd.
- Numerous overhead clearance issues along the lower decks and at the MLK Jr. Blvd. overpass
# Segment 3: Current Schematic Plan

<table>
<thead>
<tr>
<th>Mainlanes in each direction</th>
<th>Mill and Overlay</th>
<th>Widening</th>
<th>Full-Depth Reconstruction</th>
<th>Grade Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varies between 2 and 4 (+1 future)**</td>
<td>Proposed for major portion of the segment for all mainlanes (upper deck excluded)</td>
<td>Proposed for major portion of the segment in each direction. Approx. 4,100 ft. (lower deck)**</td>
<td>Proposed for approx. 4,600 ft. (lower deck)**</td>
<td>Grade changes up to 12 ft. (lower) have been proposed for this segment for approx. 4,600 ft. of the lower deck.</td>
</tr>
</tbody>
</table>

**Note:** The table includes the following points:
- Mill and Overlay: Proposed for major portion of the segment for all mainlanes (upper deck excluded).
- Widening: Proposed for major portion of the segment in each direction. Approx. 4,100 ft. (lower deck). 2 lanes in each direction.
- Full-Depth Reconstruction: Proposed for approx. 4,600 ft. (lower deck).
- Grade Change: Grade changes up to 12 ft. (lower) have been proposed for this segment for approx. 4,600 ft. of the lower deck.
Segment 3: Pavement Design Alternative (30 Year Design Life)

Option 1: FULL DEPTH HMA
- 2.5” – Year 28
- 3.5” – Year 10
- 16.5” HMA
- Subgrade or Embankment

Option 2: HMA + FLBS
- 4.0” – Year 10
- 15.0” HMA
- 8.0” FLBS

Option 3: CRCP
- 14.5” CRCP
- 1.0” HMA
- 6.0” CTB
- Subgrade or Embankment

Option 4: Precast Concrete Pavement
- 9.0” PPCP
- LCB
- Subgrade or Embankment
### Segment 3: Pavement Design Alternative (30 Year Design Life)

<table>
<thead>
<tr>
<th>Material Removal and Delivery</th>
<th>HMA Full Depth</th>
<th>CRCP</th>
<th>PPCP</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Depth of Section</em></td>
<td>24 in.</td>
<td>21.5 in.</td>
<td>9 in.</td>
</tr>
<tr>
<td>Material Removal and Delivery</td>
<td>1.5-2 ft.</td>
<td>2-2.5 ft.</td>
<td>9 in.-1 ft.</td>
</tr>
<tr>
<td>Subgrade Stabilization</td>
<td>Compacted Subgrade</td>
<td>1 in. HMA + 6 in. CTB + Compacted Subgrade</td>
<td>2-6 in. LCB-RS</td>
</tr>
<tr>
<td>Pavement Foundation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 30 year design life pavement section
### Construction Time to Opening

<table>
<thead>
<tr>
<th></th>
<th>HMA Full Depth</th>
<th>CRCP</th>
<th>PCP</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Construction Time Requirements (per mile)</em></td>
<td>8 days/24 hour closure</td>
<td>13 days/24 hour closure</td>
<td>11 nights/9p-5a closure (500 ft./night)</td>
</tr>
<tr>
<td>Width of Work Zone</td>
<td>2 Lanes</td>
<td>2 Lanes</td>
<td>2 Lanes</td>
</tr>
<tr>
<td>Lane Closure Requirements</td>
<td>1 lane (3 lanes open, narrow width)</td>
<td>1 lane (3 lanes open, narrow width)</td>
<td>2 lanes (1-2 lanes open)</td>
</tr>
<tr>
<td>Time Before Traffic on Pavement</td>
<td>6-8 days (if traffic permitted on base course)</td>
<td>13 days</td>
<td>Immediate</td>
</tr>
<tr>
<td>Total Time from Start Construction to Open</td>
<td>14-16 Days</td>
<td>26 Days</td>
<td>11 Days</td>
</tr>
<tr>
<td>Value of Time/Road User Costs</td>
<td>LCCA Results</td>
<td>LCCA Results</td>
<td>LCCA Results</td>
</tr>
</tbody>
</table>

* Unable to perform CRCP or Full Depth HMA during overnight enclosure
## Life Cycle Cost Analysis (LCCA)

<table>
<thead>
<tr>
<th></th>
<th>Annualize Pavement Maintenance Cost</th>
<th>20 Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine Maintenance</td>
<td>$666,975.90</td>
<td>$13,339,517.92</td>
</tr>
<tr>
<td>Preventative Maintenance</td>
<td>$3,715,170.98</td>
<td>$74,303,419.56</td>
</tr>
<tr>
<td>Total PM/RM</td>
<td>$4,382,146.87</td>
<td>$87,642,937.48</td>
</tr>
</tbody>
</table>

### Maintenance Costs (Current Flexible Pavement)
- Control Section (0015-13) = 18.5 centerline miles
- Historic cost from DCIS and Compass
- Costs are present value costs.
- Cost to maintain high level of service (Condition Score > 90)
## Life Cycle Cost Analysis (LCCA)

<table>
<thead>
<tr>
<th>Maintenance Costs (Current Rigid Pavement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Control Section (0015-13) = 1.8 centerline miles</td>
</tr>
<tr>
<td>- Historic cost from DCIS and Compass</td>
</tr>
<tr>
<td>- Costs are present value costs</td>
</tr>
<tr>
<td>- Cost to maintain high level of service (Condition Score &gt; 90)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table: Annualize Pavement Maintenance Cost</th>
<th>20 Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine Maintenance</td>
<td>$903.00</td>
</tr>
<tr>
<td>Preventative Maintenance</td>
<td>$0.00</td>
</tr>
<tr>
<td>Total PM/RM</td>
<td>$903.00</td>
</tr>
</tbody>
</table>
Long-Term Performance

I-10, Los Angeles PPCP Project

(AADT = 220,000)
Segment 3: Life Cycle Cost Analysis (LCCA)

- Costs are for new construction only as indicated by current schematics; not include rehabilitation activity.
- PCP costs assumed $350/SY at the time of analysis (very conservative).
- Currently the projection is approx. $225-300/SY or initial cost of around $2000 initial cost.

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Pavement Alternative</th>
<th>Initial Construction Cost ($1000)</th>
<th>Total Maintenance and Rehabilitation Cost¹</th>
<th>Total Agency Cost</th>
<th>User Cost²</th>
<th>Total Cost LCCA³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Blvd. to MLK Jr. Blvd.</td>
<td>HMA CRCP PCP</td>
<td>$727 $723 $2,983</td>
<td>$673 $167 $119</td>
<td>$1,101 $796</td>
<td>$4,722 $8,833</td>
<td>$5,823 $9,680</td>
</tr>
</tbody>
</table>

All cost shown (in $1000) are for one lane-mile, except where indicated, in Present Value.
1. Total sum of maintenance and rehabilitation costs for 30 years in present value.
2. User cost was calculated by RealCost2.5 based on 24 hour road closure for HMA & CRCP; 9PM–5AM road closure for PCP.
3. Total cost was calculated by RealCost2.5 based on initial construction costs and maintenance and rehabilitation costs.
Conclusions

- Based on the high-level analysis of the study:
  - Full Depth HMA is the better option in segments with widening of existing flexible pavement and mill and overlay, such as Segment 1 (US 183 to US 290).
    - Assumes 8-10 year M&O cycle.
    - Assumes existing lanes are structural adequate for future 30 year ESALs
  - Precast pavement provides the most efficient pavement section (in terms of existing pavement removal and new materials).
  - Precast Concrete Pavement is a feasible option for accelerated construction in segments with grade changes, limited ROW and no alternative routes.
  - Precast pavement may provide benefit for other areas:
    - Accelerated intersection construction
    - Ramp reconstruction (if ramp needs to be kept open during construction)
Next Steps: Project Level Pavement Design

District 8 HVS Testing on PJCP
2005-2006 – Fontana, CA

Caltrans Heavy Vehicle Simulator

“SUZY”

- Study ESALs estimates:
  - 20 YR (FLEX) = 60 MESALs
  - 20 YR (RIGID) = 81 MESALs
  - 30 YR (RIGID) = 137 MESALs

- Actual ESALs reported by TPP
  - 20 YR (FLEX) = 80 MESALs
  - 20 YR (RIGID) ~ 106 MESALs
  - 30 YR (RIGID) ~ 179 MESALs

> 150,000,000 ESALs – No Failed Slabs

Courtesy, Kirsten Stahl
Next Steps: More Resolution on User Delay Costs

- User delay costs in the study relied on many assumptions

- I-35 at full volume capacity
  - 2000: 11 hour per 24 hour day
  - 2016: 17 hour per 24 hour day

- Estimated user delay costs on IH-35 by CTR:
  - $405,000 (3 hour closure)
  - $810,000 (5 hour closure)

- Need to include cost impact on re-routing to other State and local roadways
Next Steps: Impact of New Material Delivery

- Estimate number of truck trips per-lane-mile of pavement construction required to deliver material
- Lower number of trucks:
  - Increases the certainty of production (lower construction time & costs)
  - Reduce the construction footprint and user delay time and costs

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>*Pavement Thickness (in.)</th>
<th>Volume (CY)</th>
<th>Weight (TONs)</th>
<th>No. of Panels</th>
<th>No. of Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA</td>
<td>22.5</td>
<td>-</td>
<td>8910</td>
<td>-</td>
<td>446</td>
</tr>
<tr>
<td>CRCP</td>
<td>14.5</td>
<td>2836</td>
<td>-</td>
<td>-</td>
<td>284</td>
</tr>
<tr>
<td><strong>PCP</strong></td>
<td>9.0</td>
<td>-</td>
<td>-</td>
<td>211</td>
<td><strong>53</strong></td>
</tr>
</tbody>
</table>

* Based on 30 years pavement design life

** Panels can be stockpile on the ROW; Only two-four flat bed trucks required during installation.
Do you agree?

Miguel Arellano, 7/22/2017
Next Steps

- Detailed project-level assessment
  - Lane closure restrictions
  - Impact on traffic control and flow based on new material delivery
  - Segment-specific requirements
- Final project-level design (with project level traffic ESALs)
- Determine final, project level cost savings in construction time and user delay cost with accelerated option
- Re-analyze LCCA with project-level assessment
  - Refined user delay and construction costs
- Hold another construction workshop with industry for project level assessment
- Determine if alternates are a viable option.
Next Steps

- If PCP is selected:
  - Design
    - Select precast concrete pavement system
    - Precast pavement layout
    - Thickness and pre-stress design
    - Geometric considerations
  - Specification/special provision development
    - Contractor qualifications
  - Construction
    - Pre-bid workshop
    - QC plan requirements
  - Precast shop drawing review
  - Construction inspection requirements
  - Final acceptance requirements
Today

Mike Arellano, P.E. | Director of Maintenance
Austin District
7901 N. I-35, Austin, TX 78753
Phone: (512) 832-7030 | Email: miguel.arellano@txdot.gov
ACCELERATED CONSTRUCTION STRATEGIES TRAFFIC AND SAFETY
August 1, 2017
Agenda

- Accelerated Construction and Safety Considerations
- Strategies to mitigate
- Questions
Accelerated Construction and Safety Concerns

– Could time based construction incentives inadvertently compromise safety?

• Possible downsides to accelerated construction
  – Long shifts
  – 7 day a week construction schedules
  – Public Safety
Strategies to Mitigate

– Consider “scheduled” vacations
### U.S. estimates of work-related all-cause injury incidence (per 100 workers) by usual daily sleep

<table>
<thead>
<tr>
<th>Usual Hours Slept / Day</th>
<th>Number of Workers (NHIS 2004-08)</th>
<th>Percent of Workers</th>
<th>Number of est. Work-related Injuries Annually</th>
<th>Number of est. Workers Annually</th>
<th>Est. Annual Injury Incidence per 100 Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4.99 h</td>
<td>1,431</td>
<td>1.9</td>
<td>83,730</td>
<td>1,061,759</td>
<td>7.89</td>
</tr>
<tr>
<td>5 - 5.99 h</td>
<td>4,407</td>
<td>5.9</td>
<td>172,462</td>
<td>3,310,950</td>
<td>5.21</td>
</tr>
<tr>
<td>6 - 6.99 h</td>
<td>17,251</td>
<td>22.9</td>
<td>469,756</td>
<td>12,988,074</td>
<td>3.62</td>
</tr>
<tr>
<td>7 - 7.99 h</td>
<td>25,950</td>
<td>34.5</td>
<td>448,458</td>
<td>19,774,245</td>
<td>2.27</td>
</tr>
<tr>
<td>8 - 8.99 h</td>
<td>22,604</td>
<td>30.0</td>
<td>413,942</td>
<td>16,571,317</td>
<td>2.50</td>
</tr>
<tr>
<td>9 - 9.99 h</td>
<td>2,361</td>
<td>3.1</td>
<td>39,101</td>
<td>1,759,342</td>
<td>2.22</td>
</tr>
<tr>
<td>&gt; 10 h</td>
<td>1,267</td>
<td>1.7</td>
<td>41,694</td>
<td>883,551</td>
<td>4.72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>75,271</td>
<td>100.0</td>
<td>1,669,142</td>
<td>56,349,239</td>
<td>2.96</td>
</tr>
</tbody>
</table>

1Includes individuals reporting employment at a job or business and those who had reported usual sleep hours.

What we do now

- Typical SAT Strategies for Accelerated Construction
  - RUC disincentive to keep lanes open in peak traffic times
  - Use Positive Barrier
  - Milestone key project components
  - Transverse rumble strips at flagger stations
  - PRECON agenda modified to focus on project issues and safety
  - Phasing in TMS first to allow us to utilize during construction
  - TCP added temporary 2 lane exit and entrance ramps to utilize when main lanes closed
Planning for site access
Strategies to Mitigate

Illumination for night work
Strategies to Mitigate

– Control worker access to site
Strategies to Mitigate

- Include material delivery and site access as part of overall safety plan
Safety Within the Work Zone: Internal Traffic Control Plan

- Control the flow of equipment traffic to minimize backing within the work zone.
- Establishes procedures for entering and exiting the work zone.
- Distance to change lanes and decelerate into the work zone.
- Distance to accelerate into high speed traffic when leaving the work zone.
- Restrict access points into work areas.
- Design buffer spaces to protect pedestrians from errant vehicles or work zone equipment.
- Provide signs within the work zone to direct and guide pedestrians and equipment operators.
Strategies to Mitigate

– Require backup plans for incidents or unusual flow
Other Considerations

- Tow truck
- Police crossover outs
- Lane for emergency only
Strategies to Mitigate

- Safety issues addressed and integrated with constructability review
Other things to consider

- Require a site specific safety plans as bid item
Other things to consider

Use Technology to reduce risk
Other things to consider

Use Technology to convey information

– Queing tech in Austin

– Work Zone Intrusion

– Smart barrels
QUESTIONS?
ACCELERATED CONSTRUCTION AND PUBLIC INFORMATION

Diann Hodges
8/1/2017
Public Involvement and Accelerated Construction

- While traffic impacts may be more substantial during accelerated construction, with utilization of the right public involvement tools, drivers and other stakeholders are generally supportive of this type of construction.

- Involvement of the public in planning and project implementation is key to forging positive and cooperative relationships with the community.

- Providing early, continuous, transparent and effective access to project information and schedules is the best means of soliciting public support.

- Strive to be transparent regarding project issues and take reasonable steps to address concerns.

- Successful public involvement seeks to develop the project with the community.
Outreach Techniques

 Know your stakeholders
  – Understand, appreciate and consider community and stakeholder values and needs
  – Strive to incorporate or address stakeholder values in the evolution of the project

 Be responsive and consistent when distributing information and when establishing and building community trust

 Be a good neighbor during disruptive construction

 Use the right tools to meet objectives
  – Develop outreach correspondence and detour maps for distribution to stakeholders that will be impacted during construction

 Use on-road tools when available
  – Smart work zones
Tools For Success

- Provide early and often communication regarding traffic impacts to the media and general public
- Develop and provide easy to understand detour maps
- Coordinate with on-road traffic management systems, if available (i.e. dynamic messaging system, smart work zones, etc.)
- Coordinate with emergency and traffic management services
- Coordinate with sister agencies (i.e. transit and regional mobility authorities) in preparation for potential service impacts
- Share information on highway advisory radio
Important Information To Keep In Mind

- Whatever you say, whatever you write, whatever you do, make sure to communicate these four points:
  - There is a serious problem or opportunity that has to be addressed.
  - You are the right entity to be addressing the problem. Given TxDOT’s mission, it would be irresponsible not to address the problem.
  - The means by which you are addressing and approaching the problem are reasonable, sensible, and responsible. You are listening and you do care. If what you’re proposing is going to hurt someone, it’s not because you don’t care; it’s not because you’re not listening.
District Workshops on Accelerated Construction
Regional Workshop Exercises
AC-PP-17-11
David Newcomb

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
Typical Projects

A. Pavement Strengthening
B. Pavement Widening
C. Rural Intersection Reconstruction
D. Bridge Widening
E. Small Town Main Street
F. Suburban/Rural Road Widening
Exercise A: Pavement Strengthening

Project Details:

Work
- Project length: 6 mi.
- Existing: 11” asphalt, over 8” flexible base
- Mill & remove 3” & replace with 4” AC or 6” PCC
- Shoulders to match
- Soil: Expansive clay

Traffic:
- AADT = 60,000
- Peak: M-F
  - 6:30 am to 9:00 am
  - 4:00 pm to 6:30 pm
- Possible Detours:
  - Frontage road, busy downtown on wkends,
  - ramps @ 1 mi. interval

Geometric Design: High speed freeway design

Drainage: Drainage structures: adequate

Utilities: Not an issue on project

Economics: Approx. $5 M in user & non-user costs savings possible with aggressive accelerated construction schedule
**Exercise B: Pavement Widening**

<table>
<thead>
<tr>
<th>10’ shldr</th>
<th>12’ lane</th>
<th>12’ lane</th>
<th>4’ shldr</th>
<th>40’ Median</th>
<th>4’ shldr</th>
<th>12’ lane</th>
<th>12’ lane</th>
<th>10’ shldr</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Lane Limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Details:**

**Work**
- Project length: 6 mi.
- Existing: 11” concrete over 4” base
- Add 12’ lane + 4’ shldr to inside
- Alt: 8” AC/6” flex base or 8” JPCP/4” Type B
- New concrete median between directions
- Trucks not allowed on inside lane
- Soil - Expansive clay

**Traffic**
- AADT = 75,000
- Peak: M-F 6:00 am to 9:30 am 4:00 pm to 7:00 pm
- Weekend heavy not congested
- **Possible Detours:** Frontage road requires strengthening, ramps @ 1.5 mi. interval

**Geometric Design:** High speed freeway design

**Drainage:** Drainage structures adequate. Must be relocated from median area

**Utilities:** Electrical for highway lighting

**Economics:** Approx. $40 M in user & non-user costs savings possible with aggressive accelerated construction schedule
Exercise C: Rural Intersection Reconstruction

Shaded Area for Reconstruction

Project Details:

- **Work**
  - Project: Shaded Area
  - Existing: 4” AC/6” flex base
  - Fix: 8” AC or PCC/remaining material
  - Soil: Silty sand

- **Traffic**
  - AADT = 12,000 for 4-lane;
  - 3,000 for 2-lane
  - Peak: M-F 6:30 am to 9:00 am & 4:00 pm to 7:00 pm,
  - Weekend heavy traffic to recreational lake on 2-lane roadway
  - Possible Detours: Result in additional 15 miles

- **Geometric Design:** No sight distance problem
- **Drainage:** Drainage away from intersection with drop inlets
- **Utilities:** Limited electrical, cable removed & relocated
- **Economics:** Approx. $300 K in user & non-user costs savings possible with aggressive accelerated construction schedule
Exercise D: Standard Bridge Overpasses – Widening Medium Span Bridges and Solutions for Replacing Short- and Medium-Span Bridges

**Project Details**

*First part of exercise focuses on widening existing bridge to add more lanes for increased capacity*

- **Setting** - Suburban area
- **Existing bridge**
  - Medium-span lengths (80-120 ft)
  - Simply supported prestressed concrete I-girder construction
    - See figure for typical transverse section (girder type can vary)
  - Deck: reinforced concrete with precast concrete stay-in-place forms and an asphalt overlay.
- **Traffic** - AADT = 15,000
  - Peak M-F
    - 6:30 am – 9:00 am
    - 4:00 am - 7:00 pm
- **Economics**: Approx. $5 M in user & non-user costs savings possible with aggressive construction schedule

*Discussion will be expanded to discuss alternatives and challenges for full replacement of short- and medium-span bridges*
Exercise E: Small Town Main Street

**Project Details:**

**Work**
- Project length: 2 mile
- Existing: 4” AC/6” flex base, No curb/gutter
- Replace 4’ sidewalk with curb/gutter
  - 6’ Shldr. Widening
  - 2” Overlay
- Soil: Expansive clay

**Traffic**
AADT = 3,000 for main road, 500 for crossroads
Peak: M-F 7:00 am to 9:00 am & 4:30 pm to 6:30 pm
Possible Detours: side streets. Businesses on Main Street affected (20,000 sq. ft.)

**Geometric Design:** Tangent section, 10 cross roads

**Drainage:** Install storm drains

**Utilities:** Relocate cable, install electrical for lighting

**Economics:** Approx. $500 K in user & non-user costs savings possible with aggressive accelerated construction schedule
Items to Consider

- Key economic analysis factors
- ROW, utilities, environmental, historic preservation, archeology
- Public information
- Contracting methods
- Design
- Contractor selection
- Involvement of contractor
- Construction considerations
- Other
Suggested Time Utilization

• General project discussion – 15 min

• Items to consider – 15 min

• Top five challenges – 45 min

• Information needs – 15 min
Facilitator Report

• Briefly describe project

• Top 5 challenges

• Information needs
<table>
<thead>
<tr>
<th>Exercise</th>
<th>Room</th>
<th>Facilitator</th>
<th>Recorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Pavement Strengthening</td>
<td>Chatauqua A</td>
<td>Victor Vargas</td>
<td>Carlos Arcila</td>
</tr>
<tr>
<td>B-Pavement Widening</td>
<td>Chatauqua B</td>
<td>Lea Jacobson</td>
<td>Brenda Guerra</td>
</tr>
<tr>
<td>C-Rural Intersect. Reconstruction</td>
<td>River A</td>
<td>Bobby Ramthun</td>
<td>Diana Schulze</td>
</tr>
<tr>
<td>D-Bridge Widening</td>
<td>River B</td>
<td>Jose Mendez</td>
<td>William Semora</td>
</tr>
<tr>
<td>E-Small Town Intersection</td>
<td>Veramendi J (here)</td>
<td>Cathy Kratz</td>
<td>Hector Siller</td>
</tr>
</tbody>
</table>

**Guidelines for Breakout Groups**
District Workshops on Accelerated Construction
Workshop Summary
AC-PP-17-14
Jon Epps

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017
Recurring Peak-Period Congestion

- **Uncongested**
- **Congested**
- **Highly Congested**

Peak-Period Congestion on NHS

2011

2040
Unified Transportation Plan

2017 Unified Transportation Program (UTP)

2017–2026
Transportation Planning & Programming
We Build Texas

Field Guide to
Successful Project Delivery

We build Texas – Safely
We build Texas – Quality
We build Texas – On Time
We build Texas – Together

Working together to successfully deliver projects.

Texas Department of Transportation

Associated General Contractors of Texas, Inc.
Interest in Construction

- Visibility to public
- Safety
- Economics
Acceleration Goals

Good

Construction time

20 to 0 %

reduction in time to complete project

Better

Construction time

50 to 20 %
Economic Consideration

• Direct project costs
  ▪ Agency
  ▪ Some contractor

• Indirect project costs (user/non-user)
  ▪ User fuel/time
  ▪ Roadside businesses
  ▪ Business efficiency (timely delivery)
  ▪ Some Contractor

All costs eventually borne by the public
## Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
<th>Preliminary Design</th>
<th>Environmental</th>
<th>ROW Utilities</th>
<th>PS&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Need</td>
<td>• Design Concept</td>
<td>• Preliminary</td>
<td>• Data Collection</td>
<td>• Design details</td>
</tr>
<tr>
<td>• Scope</td>
<td>• Data Collection</td>
<td>• Interagency</td>
<td>• ROW map</td>
<td>• Final alignment &amp; profiles</td>
</tr>
<tr>
<td>• Cost estimate</td>
<td>• Public meetings</td>
<td>• Documentation</td>
<td>• Appraisals</td>
<td>• Roadway</td>
</tr>
<tr>
<td>• Authorization</td>
<td>• Schematics</td>
<td>• Public hearing</td>
<td>• Acquisition</td>
<td>• Operational</td>
</tr>
<tr>
<td>• Planning</td>
<td>• Preliminary</td>
<td>• Clearances</td>
<td>• Utility adjustment</td>
<td>• Bridge</td>
</tr>
<tr>
<td>• Funding</td>
<td>• Geometric</td>
<td></td>
<td></td>
<td>• Drainage</td>
</tr>
<tr>
<td></td>
<td>• Value Engineering</td>
<td></td>
<td></td>
<td>• Misc structures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Traffic control</td>
</tr>
</tbody>
</table>

- **Letting**
- **Construction**

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![Texas Transportation Institute Logo](image)
Katy Freeway (IH-10)

- 23 miles
- 280,000 VPD
- $2.6 billion (2/3 construction)
- 6 years vs 12 years
Economic Incentives - Contractor

• One job/occasional job
• Return on investment (equipment)
• Bonding capacity
• Backlog of work
• Risk
Policies and Procedures

• Develop guidelines
• District support team
  ▪ Bridges
  ▪ Pavements
  ▪ Construction planning
  ▪ Drainage
  ▪ Traffic
  ▪ Production rates
Involvement of Contractor

- Planning and design review
- Partnering
- Communication
- Workforce
Development Needs

- Project selection
- Contracting methods
- Design guides
- Contractor selection
- Involvement of contractor
- Construction considerations
Development Needs

• Evaluation tools to allow use of existing materials
  ▪ Condition of existing material
  ▪ Recycling
• Traffic modeling
• Economic analysis
• Rapid QC/QA
• Removal & replacement of materials
• Equipment development
• Materials development
CAUTION
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction
Slides Available

www.txdot.gov/business/resources/construction/regionalworkshops.html
District Workshops on Accelerated Construction

Austin, San Antonio
Embassy Suites, San Marcos
August 1, 2017