## Agenda

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<td>8:00-8:30</td>
<td>Registration</td>
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<td>8:30-8:45</td>
<td>Welcome</td>
<td>Jon Epps – TTI</td>
</tr>
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<td>History of Accelerated Construction</td>
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<td>TxDOT’s Interest</td>
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<td>Project Selection Economics</td>
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<td>Brianne Glover – TTI</td>
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<td>Project Development</td>
<td>Lonnie Gregorczyk – TxDOT, YKM</td>
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<td>Accelerated Bridge Construction</td>
<td>Jamie Farris – TxDOT, BRG</td>
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<td>Andrew Lee – TxDOT, BMT</td>
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<td>Adam Jack – TxDOT, BMT</td>
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<td>Danny Perez – TxDOT, CMD</td>
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<tr>
<td></td>
<td>• A-Pavement Strengthening</td>
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<td>• B-Pavement Widening</td>
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<td>• C-Rural Intersection Reconstruction</td>
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<td>• D-Bridge Widening</td>
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<td>• E-Small Town Main Street</td>
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<td>• F-Suburban/Rural Road Widening</td>
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<td></td>
<td>Moderators:</td>
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<tr>
<td></td>
<td>A-Frank Leong – TxDOT, HOU</td>
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<td>B-Omar De Leon – TxDOT, BMT</td>
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<td>C-Kenneth Wiemers – TxDOT, BMT</td>
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<td>D-Melody Galland – TxDOT, HOU</td>
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<td>E-Grady Mapes – TxDOT, HOU</td>
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<td>F-Allen Warden – TxDOT, BMT</td>
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<td>Recorders:</td>
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<td>A-Vada Byford – TxDOT, BMT</td>
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<td>B-Jim Mims IV – TxDOT, HOU</td>
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<td>C-Maria Aponte – TxDOT, HOU</td>
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<td>D-Kevin Grissom – TxDOT, BMT</td>
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<td>E-Lucio Ramos – TxDOT, BMT</td>
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<td>F-Feng-pin An – TxDOT, HOU</td>
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District Workshops on Accelerated Construction
Welcome AC-PP-17-01 Jon Epps
Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
www.txdot.gov/business/resources/construction/regional-workshops.html
Interest in Accelerated Construction

• Visibility to public
• Safety
• Economics
Accelerated Construction

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

Definition of Construction

Greenfield

• Capacity improvement
• Reconstruction
• Rehabilitation
• Major maintenance
• Minor maintenance
## Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
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### Time:
- Letting
- Construction

*Texas A&M Transportation Institute*
Acceleration Goals

**Good**

20 to 0 %

reduction in time to complete project

**Better**

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

Project Level Economic Screening Tool
AC-IR-17-03

by
Brianne A. Glover, J.D.
David R. Ellis, Ph.D.
Workshop Goals

• Information sharing

• Existing TxDOT “tools”

• Identify needed “tools” & “policies”
Accelerated Construction

Construction Methods

Traffic Management  Work Zone Safety

Equipment  Materials  Economics
Introductions
District Workshops on Accelerated Construction

www.txdot.gov/business/resources/construction/regional-workshops.html
District Workshops on Accelerated Construction US History
AC-PP-17-02
David Newcomb

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 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>Metric</th>
<th>Change</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

- 40% Bridges +40 Years Old
- Pavements Exceeded Design Life
<table>
<thead>
<tr>
<th>Accelerated Construction Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Financing</td>
</tr>
<tr>
<td>• Utilities</td>
</tr>
<tr>
<td>• Long Life Bridges</td>
</tr>
<tr>
<td>• Contracting</td>
</tr>
<tr>
<td>• ROW</td>
</tr>
<tr>
<td>• Long Life Pavements</td>
</tr>
<tr>
<td>• Work Zone</td>
</tr>
<tr>
<td>• Railroad</td>
</tr>
<tr>
<td>• Quality Control</td>
</tr>
<tr>
<td>• Mobility</td>
</tr>
<tr>
<td>• Communication /Outreach</td>
</tr>
<tr>
<td>• Modular/Prefab Construction</td>
</tr>
<tr>
<td>• Corridor Improvement</td>
</tr>
<tr>
<td>• Training</td>
</tr>
<tr>
<td>• Constructability</td>
</tr>
<tr>
<td>• Worker Health &amp; Safety</td>
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</tbody>
</table>
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
Project Costs by Type, Related to Duration

- Total Cost
- Construction Cost
- Contract Administration Cost
- Road User Cost

Days: 0, A, B, C, D
Cost: 0
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)
• Rubblilzation 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

Texas A&M Transportation Institute
TxDOT Interest in Accelerated Construction

AC-PP-17-03

Randy Hopmann

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
Outline

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

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- Letting
- Construction

- Time
## Economic Considerations - Examples

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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>
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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
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• Workshop Outcomes
Population 2050

- 1 - 50,000
- 50,000 – 250,000
- 250,000 – 1,000,000
- 1,000,000 – 1,500,000
- Over 1,500,000
2017 Unified Transportation Program (UTP)
2017–2026
Transportation Planning & Programming

Unified Transportation Plan
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.
Workforce
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
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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
Outline

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• Texas Landscape
• Texas History
• Opportunities
• **Workshop Outcomes**
Workshop Goals

• Information sharing

• Existing TxDOT “tools”

• Identify needed “tools” & “policies”
CAUTION
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction Economic Screening Tools
AC-PP-17-04
David Ellis
Brianne Glover
Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
Project Level Economic Screening Tool

• 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>
</tr>
<tr>
<td>Project Region</td>
<td>Urban</td>
</tr>
<tr>
<td>Retail (SQFT)</td>
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<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 chose, 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>
<thead>
<tr>
<th>Traditional Construction Parameters</th>
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<tbody>
<tr>
<td>Total Project Period (calendar days)</td>
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<table>
<thead>
<tr>
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<tbody>
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</tr>
<tr>
<td>Added Cost of Incentives</td>
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### Traditional Construction Scenario

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# Project Level Economic Screening Tool

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## Project Level Economic Screening Tool

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<tr>
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<th>Accelerated Construction Parameters</th>
<th>Values</th>
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<tbody>
<tr>
<td></td>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td>180</td>
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<td></td>
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<tr>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td>10</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>Days</td>
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<table>
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<th>Days</th>
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<table>
<thead>
<tr>
<th>Segment 4:</th>
<th>Days</th>
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<th>Days</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
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</tr>
<tr>
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</table>
Project Level Economic Screening Tool

Economic Loss

- Sales
- State Sales Tax Revenue
- Local Sales Tax Revenue
## Results

<table>
<thead>
<tr>
<th>Traditional Construction Tools</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$1,832,284,439</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$ 771,059,803</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Traditional vs Accelerated</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Road User Costs and Economic Loss</td>
<td>$1,061,224,636</td>
</tr>
<tr>
<td>Road User Cost and Economic Daily Cost</td>
<td>$ 1,983,597</td>
</tr>
<tr>
<td>B/C of Accelerated construction</td>
<td>5.31</td>
</tr>
</tbody>
</table>
Estimated User Costs and Economic Losses

- Traditional: $1,832,284,439
- Accelerated: $771,059,803

- Travel Time Value
- Operating Costs
- Loss of Sales
- Loss of Tax Revenue
- Cost to Accelerate
District Workshops on Accelerated Construction

Contacts

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b-glover@tamu.edu

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Beaumont/Houston  
Westin Oaks Houston at the Galleria  
August 10, 2017
District Workshops on Accelerated Construction Project Development
AC-PP-17-05
Lonnie Gregorcyk

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
OUTLINE

• Project Selection and Planning
• Contracting Methods
• Design
• Contractor Selection
• Involvement of Contractor
• Construction Considerations
TxDOT RESOURCES

- 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
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
DESIGN

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
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
Partnering

• 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
INVolVEMENT OF CONTRACTOR

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

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
ACCELERATED BRIDGE CONSTRUCTION IN TEXAS (AND BEYOND)

Jamie Farris – Bridge Division
Andrew Lee – Beaumont District
Accelerated Bridge Construction (ABC) Techniques

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

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
Precast Columns
TxDOT’s Bread & Butter: Girders and Deck Panels
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 are not really considered “Accelerated Bridge Construction.”

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

Precast Abutment

Decked Slab Beams

Precast Bent Cap

Steel Piling
Full Width, Full Depth Panels
Self Propelled Modular Transporters (SPMT)

Photos Courtesy of Heavy Equipment Guide
SPMT – Fort Worth West 7th Street Arches
Modular Units
Modular Units (No Deck) – 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)
Lateral Slide-in – LP 345 (San Antonio)
QUESTIONS?

Jamie Farris – Bridge Division
Andrew Lee – Beaumont District
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ACCELERATED CONSTRUCTION STRATEGIES - DESIGN

Adam Jack, PE – Beaumont District
# Table of Contents

<table>
<thead>
<tr>
<th></th>
<th>Contractors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Avoidance</td>
<td>6-7</td>
</tr>
<tr>
<td>3</td>
<td>Repetition</td>
<td>8-9</td>
</tr>
<tr>
<td>4</td>
<td>Simplicity</td>
<td>10-11</td>
</tr>
<tr>
<td>5</td>
<td>Summary</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Questions</td>
<td>13</td>
</tr>
</tbody>
</table>
Design Considerations for Non-Emergencies

The “Real” Focus

Contracts

Beware Gremlins

Avoidance

Lego Land

Repetition

Keep It Simple

Simplicity
Design Considerations - The “Real” Focus

**Contractors**

- **Materials**
  - Readily available
  - Basic mix designs
- **Equipment**
  - Nothing massive
  - Basic forms
- **Labor**
  - Normal regional capabilities
  - Repetition = Process Refinement
- **No substitute for contractor input**
  - Informal dialogue
  - Formal feedback through groups (AGC)
Design Considerations - Contractors

I-10 Widening in Orange County (Texas Sterling)

- **Materials**
  - Concrete Pavement
  - TCP Barrier

- **Equipment**
  - Standard (dozer, backhoe, loader, ...)
  - Pavement forms w/finisher

- **Labor**
  - Superintendent, Operators, Finishers, Laborers
  - Continuous repetition = increased production rates
Avoidance

- Bad soils
  - Plan for the worst; hope for the best
  - Use generally accepted foundations
    - Piles
    - Drilled shafts
  - Abandoned foundation / debris

- Utilities
  - Aerial power
  - Pipelines / oil canals
  - Telecommunications
I-10 Widening FM 365 to Hampshire

- Bad soils
  - “Gumbo” clay and weekly rainfall
  - Limit foundation types
    - Piles
    - Drilled shafts
  - Bridge existing box culvert

- Utilities
  - Petro/Chemical pipeline galleries
  - Pre-approved pipeline slab protection
  - Relocation of electric distribution
  - Flexibility for water line conflict with foundations
**Repetition**

- Repeatable features are good
  - Curb
  - Curb ramps
  - Inlets
  - Girders
- Ease of Construction over Economy
  - Transitions
  - Variations in elevation
Design Considerations - Repetition

US 69 Slope Stabilization (Hayward-Baker)

- Repeatable features
  - Soil nail patterning
  - Form inserts

- Limited layout modifications
  - Two transition castings
  - Two wall profile changes
Simplicity

- Use what’s familiar
  - Geometry
  - Typical regional items
  - TCP layouts
- Allow for field adjustments
  - Use “preferable” guidelines
  - Provide flexibility to maintain schedule
- Consider complex pre-fabrication for faster field erection
Design Considerations - Simplicity

I-10 Major Drive (Williams Brothers)

- Use what’s familiar
  - Geometry
  - Structures
- Allow for field adjustments
  - Staging & laydown areas
  - TCP Elements
Design Considerations - Summary

Construction
Avoidance
Repetition
Simplicity

Designers should provide our customers (Texas contractors) the best possible opportunity to finish every project on-time and on-budget.
Questions & Answers

For more information, please feel free to contact:

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ACCELERATED CONSTRUCTION STRATEGIES

TRAFFIC AND SAFETY

Shane Cossey, E.I.T. - Houston
<table>
<thead>
<tr>
<th></th>
<th>Reasons For Changes To Traffic</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Impacts To Construction</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Multi-Project Management</td>
<td>5-6</td>
</tr>
</tbody>
</table>
Reasons For Changes To Traffic

- Project Completion
- Milestones
- Impacts to construction
- Multi-Project management
Impacts To Construction

Weather
- Rain
- Flooding

Slow Construction
- Availability of Labor
- Availability of Materials

Utilities and ROW
- Relocation of Utilities
- Unknown utilities
- ROW acquisition
Multi-Project Management

PROJECT A

PROJECT B
Multi-Project Management

- Development of traffic control
- Pros and Cons
- Impacts to project phasing
- Solutions
- Safety
QUESTIONS?
ACCELERATED CONSTRUCTION WORKSHOP
Super Bowl Week & Construction
August 10, 2017
Overview

- The City of Houston hosted Super Bowl LI (51) on February 5, 2017.
- Super Bowl Live – More than 1 million visitors were expected to attend over the 10-day period.
  - NFL Experience, Sanctioned NFL Events, Unsanctioned Events, Spontaneous Events
- Houston District Emergency Operations Center (EOC) activated during the 10 day period to maintain situational awareness and support sections and other agency efforts related to Super Bowl LI activities.
Emergency Operations Center

- **EOC**
  - Served as TxDOT Houston District command
  - Coordinated sections and supporting divisions to mitigate adverse conditions which may have cascading impacts on Super Bowl LI events/venues

- Maintained situational awareness of all Super Bowl LI related activities, sanctioned and unsanctioned, and other special events throughout the city

- Provided resources to support to sections and divisions that have personnel and assets deployed to provide safety for the public.
Construction Closures

- With an increase in number of travelers throughout the area, TxDOT worked on limiting major closures to keep traffic flowing on major thoroughfares inside Beltway 8.
- Challenging to accomplish with accelerated major projects.
  - Began discussions early with contractor project managers.
  - Found solutions to allow critical path work to occur with the least amount of disruption to traffic.
    - Examples: US 290 and Beltway 8 North
- Working together with contractors to make Houston look good.
  - Work zones, debris pickup, sweeping
- Outreach via Social Media
- End Result = Success
  - Super Bowl Houston Host Committee, City of Houston, Harris County all appreciative of our combined efforts to keep roadways open
DYNAMIC MESSAGE SIGNS (DMS)

- Houston Super Bowl Host Committee’s Traffic and Transportation group worked with TxDOT on DMS messaging.
Teams on the Move
CONCRETE BARRIERS

- City of Houston Police Department requested assistance in placing concrete barriers in downtown
  - TxDOT provided 133 concrete barriers – 30 foot long each
  - Process to bring in barriers and install took about 12 hours
  - Coordinated effort with City of Houston Public Works Department, City of Houston Police, Harris County and NFL Security

- Removal of barriers began at 4 p.m., Sunday, February 5
Mobile Barrier

MOBILE BARRIER

- City of Houston Police Department requested assistance in placing barriers for NFL Honors red carpet event downtown.
  - TxDOT placed a mobile barrier rig for the event that could easily be moved in and out, removing the need for a long term lane closure.
ACCELERATED CONSTRUCTION BEFORE SUPER BOWL 51

ACCELERATED CONSTRUCTION

- Houston Avenue/ Allen Parkway entrance ramps to IH 45
  - Close to downtown
  - West Dallas Bridge (completed over the span of a few weekends)

- Yale St. Bridge
  - Important for sanctioned events in the area including Bruno Mars and Taylor Swift Concerts
Questions

Danny Perez
Public Information Officer
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(713) 802-5077
Accelerated Construction

“An Admirable Goal”

ACCELERATED CONSTRUCTION WORKSHOP

Houston, Texas

Presented by: Bob Lanham, President
Williams Brothers Construction Co., Inc.

August 10, 2017
Every job is different.

• Quote from a past Executive Director of TxDOT

“We need to engineer every project.”
- Mike Behrens, PE
Contractors Perspective

- Contractors are incentivized by simple business principles to work quickly.
- Cash flow
- Workforce stability
So, we think this job needs “acceleration”?

• There’s THREE things to consider
• What needs to be accelerated?
• Contract tools available
• What are the influencers of success?
What needs to be accelerated?

• Entire job?
• Certain discrete elements?
• Both?
Contract Tools

- Incentives & Milestones
- A+B Bidding
- Concurrent Work
- Value Engineering
Incentives & Milestones

- Strategic usage
- Achievable
- Incentives substantial
A+B Bidding

• Recognizes value of time
• Contractor “buy in” at bid time
• Reasonable parameters
Concurrent Work

• Don’t limit where the Contractor can work
• Improves schedule and creates float
• Improves productivity
Value Engineering

• Encourage ideas to improve approach to the project
• Share in value created
Acceleration Influencers

- Plans, Specifications, & Constructability
- Constraints
- Project Management
Plans, Specification, & Constructability

- Phasing
- Technical Specifications
- Construction issues
Constraints

- Third parties
- ROW
- Utilities
- Traffic Control
Project Management

• Decision Matrix
• Partnering
• CE&I Complexity
QUESTIONS?
District Workshops on Accelerated Construction
Regional Workshop Exercises
AC-PP-17-11
David Newcomb

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 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**

<table>
<thead>
<tr>
<th>10’ shldr</th>
<th>12’ lane</th>
<th>12’ lane</th>
<th>4’ shldr</th>
</tr>
</thead>
<tbody>
<tr>
<td>12’ lane</td>
<td>4’ shldr</td>
<td>10’ shldr</td>
<td></td>
</tr>
</tbody>
</table>

| 30’ Median |

**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
### 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

<table>
<thead>
<tr>
<th>Project Details:</th>
<th>Traffic</th>
<th>Geometric Design:</th>
<th>Drainage:</th>
<th>Utilities:</th>
<th>Economics:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Project: Shaded Area</td>
<td>AADT = 12,000 for 4-lane;</td>
<td>No sight distance problem</td>
<td></td>
<td></td>
<td>Approx. $300 K in user &amp; non-user costs savings possible with aggressive accelerated construction schedule</td>
</tr>
<tr>
<td>• Existing: 4” AC/6” flex base</td>
<td>3,000 for 2-lane</td>
<td></td>
<td>Drainage away from intersection with drop inlets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fix: 8” AC or PCC/remaining material</td>
<td>Peak: M-F 6:30 am to 9:00 am &amp; 4:00 pm to 7:00 pm, Weekend heavy traffic to recreational lake on 2-lane roadway</td>
<td></td>
<td>Utilities: Limited electrical, cable removed &amp; relocated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Soil: Silty sand</td>
<td>Possible Detours: Result in additional 15 miles</td>
<td></td>
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</tbody>
</table>
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
Exercise F: Suburban/Rural Road Widening

Project Details:  

Work  
• Project length: 6 mi.  
• Existing: 2” AC/8” Flex Base,  
• FDR entire existing 24’ width  
• Add 6’ Shldr. Widening  
• Place 4” HMA surface  
• Soil: Expansive clay  

Traffic  
AADT = 3,000 for main road with 20 driveways  
Peak: M-F  
6:30 am to 9:00 am &  
4:30 pm to 6:30 pm

Possible Detours: Result in additional 5 mi.  
Geometric Design: Adequate design, no major changes in horizontal & vertical alignment  
Drainage: 1 box culvert & 5 pipe culverts need widening  
Economics: Approx. $1M in user cost savings possible with aggressive accelerated construction schedule  
Utilities: Not an issue
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
## Breakout Groups

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Moderator</th>
<th>Recorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Frank Leong</td>
<td>Vada Byford</td>
</tr>
<tr>
<td>B</td>
<td>Omar DeLeon</td>
<td>Jim Mims, IV</td>
</tr>
<tr>
<td>C</td>
<td>Kenneth Wiemers</td>
<td>Maria Aponte</td>
</tr>
<tr>
<td>D</td>
<td>Melody Galland</td>
<td>Kevin Grissom</td>
</tr>
<tr>
<td>E</td>
<td>Grady Mapes</td>
<td>Lucio Ramos</td>
</tr>
<tr>
<td>F</td>
<td>Allen Warden</td>
<td>Feng-pin An</td>
</tr>
</tbody>
</table>
Breakout Group Rooms

Group A

Group D
Room
(Breakout)

Group C
Oak Room
(Breakout II)

Group B
Room
(Breakout)

Group E

Group F

Consort Ballroom
District Workshops on Accelerated Construction

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017
District Workshops on Accelerated Construction
Workshop Summary
AC-PP-17-14
Jon Epps

Beaumont/Houston
Westin Oaks Houston at the Galleria
August 10, 2017

www.txdot.gov/business/resources/construction/regional-workshops.html
Population 2050

- 1 - 50,000
- 50,000 – 250,000
- 250,000 – 1,000,000
- 1,000,000 – 1,500,000
- Over 1,500,000
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

We Build Texas
Interest in Accelerated 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>
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<td></td>
<td>• Traffic control</td>
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<td>• Review</td>
</tr>
</tbody>
</table>

- Letting
- Construction

Time
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
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction

www.txdot.gov/business/resources/construction/regional-workshops.html
District Workshops on Accelerated Construction
District Workshops on Accelerated Construction

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