AASHTO TIG - CAST
Construction Analysis Software Tools

Traffic Modeling and Construction Analysis Tools
for Minimizing Costs and Impacts for Rehabilitation and Reconstruction Projects

AASHTO 2006 Annual Meeting

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California Department of Transportation
The Challenge We Face

• Highway infrastructure must be renewed
  – Many pavements have reached their design life
  – We must maintain, rehabilitate, and reconstruct highways under traffic

• Impacts of construction to the general public must be minimized
  – Lane closures create adverse impacts to motorists, local communities, and businesses
  – Work zones responsible for about 12 percent of highway traffic delay
  – Safety: 40,000 injuries, 1028 fatalities in work zones in USA in 2003

• These are conflicting objectives
New Federal Rule

• Requires preconstruction analysis, including:
  • State-wide process
    – Work zone assessment & management procedures
    – Work zone crash and operation data collection
    – Bi-annual training and process review
  • Project-level procedures
    – Transportation Management Plan (TMP) in PS&E
    – Consideration in TMP of traffic control devices, network operations, public outreach
    – Contractor incentives for safety and mobility performance
    – Assignment of person responsible for TMP, safety and mobility
How Do We Meet This Challenge

• Integrated analysis approach to balance and optimize competing objectives
  – Longer lasting pavements
  – Faster delivery of construction
  – Tolerable traffic delays
  – Within agency budget and scope

• AASHTO TIG: Construction Analysis Software Tools (CAST) Promotion
  – Recently conducted a survey for the federal rule
  – Identify and publicize tools for this challenge
  – Seek more participating state DOTs
AASHTO Survey of State DOTs: 34 states responding

Have you developed a policy/procedure to deal with the new Federal work zone rule?

- Yes, 47%
- No, 53%

If there were a tool available for minimizing costs and delay, would you be interested?

- Yes, 97%
- No, 3%
Solutions to Help Implement New Federal Rule: Tools

• Microscopic traffic simulation software
  – Examples: VISSIM, Paramics, MITSIM, Corsim
  – Assess the work zone impact on network
  – Graphics are very useful for public outreach
  – Expensive to implement, other less expensive tools may provide results of similar accuracy

• Construction Schedule Comparison Tools
  – Example: CA4PRS (FHWA pooled fund study (CA, MN, TX, WA))
  – A software tool to calculate construction duration and traffic delay for different strategies: pavement structures, traffic closures, and construction logistics
Analyses a DOT Can Perform with These Tools

• Depending on tool selected:
  – ‘What-if’ scenarios evaluation
  – Construction schedule; Traffic delay and user cost; Agency cost
  – Pre-construction analysis in planning, scoping, and design
  – Multi-discipline team solution
  – Optimize local signal timing
  – Evaluate closure impact on detour routes
  – Compare various contracting methods
Examples
CA4PRS Implementation Projects

I-710 Compton Project
In development

I-10 Pomona Project
1999

I-710 Long Beach Project
2003

I-15 Devore Project
2004

I-15 Ontario Project
In development

Use by other sponsoring DOTs
- I-5 Seattle (WA), PCC
- I-494 St. Paul (MN), AC
Case Study on I-15 Devore Reconstruction Project
I-15 Devore Project Summary
Southern California (San Bernardino)

• Each direction: outside truck lane reconstructed, slab replacements in second truck lane
  – Project is 3 miles long

• About 130,000 ADT (15% heavy trucks)
  – Unique traffic pattern: weekday commuter and weekend leisure (to and from Las Vegas)

• Two truck lane reconstruction: 3-mile stretch
  – Rebuilt with 12” PCC (12-hour mix) with 6” AC base
  – One roadbed full closure with counter-flow traffic
  – Two 9-days continuous closures (24/7 operations)

• Saved $6M agency and $2M user cost with CA4PRS
## I-15 Devore Pre-Construction Analysis with CA4PRS: Schedule-Traffic-Cost

<table>
<thead>
<tr>
<th>Construction Scenario</th>
<th>Schedule Comparison</th>
<th>Cost Comparison ($M)</th>
<th>Max. Peak Delay (Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Closures</td>
<td>Closure Hours</td>
<td>User Delay</td>
</tr>
<tr>
<td>One Roadbed Continuous (24/7)</td>
<td>2</td>
<td>400</td>
<td>5.0</td>
</tr>
<tr>
<td>72-Hour Weekday Continuous</td>
<td>8</td>
<td>512</td>
<td>5.0</td>
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<tr>
<td>55-Hour Weekend Continuous</td>
<td>10</td>
<td>550</td>
<td>10.0</td>
</tr>
<tr>
<td>10-Hour Night-time Closures</td>
<td>220</td>
<td>2,200</td>
<td>7.0</td>
</tr>
</tbody>
</table>
I-15 in Salt Lake County
Microscopic Simulation for I-15 Reconstruction Projects in Utah

- Used for 5 projects (17 miles) in Salt Lake City
  - $1.4 billion of work, 142 bridges, 3 big interchanges
- Alternatives considered: Design-Build, Design-Bid-Build, No-build
- Used VISUM: Microscopic traffic simulation
  - Network traffic analysis to calculate user delay cost
- Results showed Design-Build better
  - Saved $500 million of user delay cost
  - Reduced schedule from 9 years to 4 years
  - Fewer accidents
- Compared various traffic control plans
What AASHTO is doing

• Established AASHTO TIG - CAST
  – Made up of FHWA, AASHTO, & several states using software tools
  – Intended to evaluate the various tools and provide information to States on what each one does.

• Upcoming Activities
  – FHWA & AASHTO working on Expert User Panel
  – Brochures and references are being made available

• For Latest Information
  – http://tig.transportation.org/?siteid=57&pageid=1824
Thank you!
More Information?

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