March 2010 ABC Pooled Fund Study TAC Teleconference

3/10/2010
Introductions
Review of January 2010 TAC meeting
Task 1 updates
Review of findings from primary literature review content areas
Next steps
Discussion
NOAs
Project Goals and Target Users

- **Goals of Project**
  - Focuses on bringing ABC to ordinary (bread and butter) bridges
  - Tool can be used to help with communications
  - Create decision tool for engineers
  - Assists users of ABC elements in making ABC standard process (standardization)

- **Target User Population**
  - Project managers: makes the decision => output needs to be clearly communicated
  - Engineers: use the tool to create detailed estimates
  - District owners of project
  - Budget office
Model Variables (1)

- **Costs**
  - construction costs (ABC vs. Conventional alternatives)
  - user costs e.g. crash costs, delay cost (including quality of life), vehicle operating costs
  - maintenance costs
  - loss of revenue (e.g. tolls)

- **Time**
  - constraints due to emergencies
  - construction time (ABC vs. Conventional alternatives) e.g. CIT and CCT

- **Technical aspects**
  - restrictions e.g. level of technical risk, seismic design, conflicts with other constructions
  - detour length (time and mileage) and limitations

- **Environment**
  - restrictions e.g. urban vs. rural locations, remoteness, railroad, water-work, habitat, weather)
  - environmental impact e.g. noise, emissions, and carbon footprint
Model Variables (2)

- **Work zone**
  - traffic characteristics e.g. ADT, maximum amount of acceptable traffic queues, traffic closures, lane reductions, delay thresholds, acceptable delays
  - safety and exposure
  - social impact e.g. impact on traveling public, local business
  - life cycle impact
## Model Outputs

- $’s
- Cost savings / hour
- Time savings
- Performance measures e.g. hours of travel delay

- User manual with references to successful ABC projects and scenarios
- Different contracting methods should be allowed
- User should be able to define incentive and disincentives
Task 1 Update
Sharing Information

- Developed project website for sharing all files/information resulting from pooled fund study
- Get a username, send username to research team
- Login at [http://my.oregonstate.edu](http://my.oregonstate.edu)
Sending Files to Research Team

Tools

- Address Book
- Calendar
- Digital Dropbox
- Glossary
Sending E-mail to Research Team

Communications

Announcements
Collaboration
Discussion Board
Group Pages
Messages
Roster
Send Email

Tools
Communication
Organization
Tools
My Portfolios
Organization Map

Refresh
Detail View
1 Task 1

1.1 Literature Review

1.1.1 Current state of ABC implementation
- 1.1.1.1 Collect all existing reports and presentations
- 1.1.1.2 Current processes and criteria for decision making
- 1.1.1.3 Current goals and barriers of using ABC to determine ABC maturity level
- 1.1.1.4 summarization
- 1.1.2 Reports on best practices associated with ABC projects
- 1.1.3 Current propensity for using ABC due to organization culture and industry
- 1.1.4 Recommendations from ASHTO, NCHRP, RGB, FHWA

1.1.5 Cost estimation studies
- 1.1.5.1 Collecting all relevant papers and studies
- 1.1.5.2 Review economic models and evaluation processes
- 1.1.5.3 Preliminary ideas for cost estimation model

1.2 Task 1 Report
Task 1: Conduct Literature Review

- Reviewed more than 40 documents (journal and conference publications, technical reports, theses, presentations, etc).
- Identified four primary content areas
  - Decision making
  - Successful ABC projects
  - PBES techniques and innovations
  - Cost estimation
Findings from Literature
Decision Making Processes and Criteria

- Framework for PBES Decision Making: Flowchart and Matrix for High-Level decision making
- Using AHP to consider both tangible and intangible factors.
Findings from Literature

SUCCESSFUL ABC PROJECTS
ABC Best Practices Sources

- Accelerated Bridge Construction Success Stories (FHWA, 2006)
- California and Washington strategic plans, UDOT white paper on benefits and costs of PBES
- Scan reports from Europe and Japan introducing accelerated construction projects conducted using innovative accelerated technologies
ABC Maturity Level

Primary ABC Goals

- Deliver projects earlier to traveling public
- Reduce the impacts of on-site construction
- ABC to become Standard Practice
• **Barriers to ABC Use**
  - Traffic detour issues
  - Technical issues related to seismic design, structure durability and reliability
  - Poor communication and coordination between stakeholders
  - Lack of technology for rapid bridge construction and replacement technologies for extreme events
  - Development needed in design methodologies, contracting approaches, material supply chain management
• Delivering bridge construction projects quickly to reduce congestion and improve safety.
• Delivering long lasting bridges quicker.
• September 11 and subsequent potential threats to U.S. transportation systems ➔ need to develop emergency response plans to quickly react to consequences of extreme events.
ABC Justification from Federal Perspective (1)

- Develop, Implement, and Promote ABC: Because of the success of accelerated bridge construction projects to date, the FHWA has increased its support efforts and resources to further advance the development of these systems into more conventional practice nationwide.

Recommendations for Updating Highway Emergency Response Plans for Extreme Events (AASHTO, FHWA), Design of Bridges for Extreme Events (NCHRP)

Focus of recent national initiatives by AASHTO TIG and FHWA is on newer, innovative prefabricated bridge elements and systems, e.g., bent caps, abutments, full-depth deck panels, and totally prefabricated superstructure and substructures.
ABC Technologies Currently in Use

Source: Successful use of accelerated bridge construction techniques in UTAH, New Jersey DOT, 2009
Management Best Practices in Use

- Staged construction
- Changing normal operational procedures along with A+B contracting
- Changing normal operational procedures I/D contracting
- Lane Rentals
- New design techniques and materials
Findings from Literature
Cost Estimation Approaches (1)

- User Cost Categorization: Vehicle operational costs (VOC), Delay Costs, Crash Costs or Safety Related Costs (report_012309)
- Assessing value of time lost in congestion and vehicle operating costs resulting from congestion
Many agencies are investigating economic tools such as life-cycle cost analysis (LCCA) to help them choose the most cost-effective alternatives and communicate the value of those choices to the public.

Cost Estimation Approaches Examples

Table A-3: Average Auto Operation Cost in Washington State.

<table>
<thead>
<tr>
<th>Vehicle-Based</th>
<th>$/mile</th>
<th>$/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel cost (excluding taxes)</td>
<td>0.121</td>
<td>5.44</td>
</tr>
<tr>
<td>Fuel taxes</td>
<td>0.023</td>
<td>1.05</td>
</tr>
<tr>
<td>Engine oil change</td>
<td>0.012</td>
<td>0.53</td>
</tr>
<tr>
<td>Repair and maintenance</td>
<td>0.049</td>
<td>2.205</td>
</tr>
<tr>
<td>Tire cost</td>
<td>0.007</td>
<td>0.315</td>
</tr>
<tr>
<td>Tolls</td>
<td>0.007</td>
<td>0.315</td>
</tr>
<tr>
<td>Sub Total</td>
<td>0.21</td>
<td>9.53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Driver/Passenger-Based</th>
<th>$/mile</th>
<th>$/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% of average wage rate</td>
<td>0.25</td>
<td>11.19</td>
</tr>
<tr>
<td>Sub Total</td>
<td>0.25</td>
<td>11.19</td>
</tr>
<tr>
<td>Total Expense</td>
<td>0.46</td>
<td>20.72</td>
</tr>
</tbody>
</table>

Table 11. Summary of LCCA cost computations (20-year analysis period).

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Age (yrs)</th>
<th>Baseline/Pavement Service Life (11 years)</th>
<th>As Built (PCC) Pavement Service Life (20 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Design and Engineering, Construction, Construction Engineering, and Incentives</td>
<td>0</td>
<td>$3,792,084</td>
<td>$5,511,328</td>
</tr>
<tr>
<td>Delay-Related User Costs</td>
<td></td>
<td>$2,064,185</td>
<td>$3,452,435</td>
</tr>
<tr>
<td>Crash-Related User Costs</td>
<td></td>
<td>$7,667</td>
<td>$0</td>
</tr>
<tr>
<td>Preventive Maintenance (MDOT Manual)</td>
<td>1:12 lane-mile @ $27,392 per lane mile</td>
<td>$302,275</td>
<td>$362,375</td>
</tr>
<tr>
<td>Preventive Maintenance (MDOT Manual)</td>
<td>1:12 lane-mile @ $44,801 per lane mile</td>
<td>0 (as-built)</td>
<td>0 (as-built)</td>
</tr>
<tr>
<td>Reconstruct or HMA Overlay</td>
<td></td>
<td>$102,048</td>
<td>$2,551,056</td>
</tr>
<tr>
<td>Preliminary Design and Engineering, Construction (Roadway Pay Item), Mobilization, Traffic Control, Contingencies, Construction Engineering)</td>
<td>11 (baseline)</td>
<td>$127,525</td>
<td>$76,532</td>
</tr>
<tr>
<td>Delay-Related User Costs</td>
<td></td>
<td>$2,064,185</td>
<td>$3,452,435</td>
</tr>
<tr>
<td>Crash-Related User Costs</td>
<td></td>
<td>$7,667</td>
<td>$0</td>
</tr>
<tr>
<td>Salvage Value (2 of 11 years remaining life for baseline pavement)</td>
<td>20</td>
<td>$302,107</td>
<td>$0</td>
</tr>
<tr>
<td>Total Actual Costs</td>
<td></td>
<td>$19,977,615</td>
<td>$6,308,587</td>
</tr>
<tr>
<td>Net Present Value of All Costs</td>
<td></td>
<td>$9,679,653</td>
<td>$6,116,583</td>
</tr>
</tbody>
</table>
Next Steps
Task 1: Conduct Literature Review

- Document literature review findings in written report
  - Complete list of reviewed reports and citation
  - One paragraph summary of each document
  - Synthesized summary of findings
Task 2: Document Current Use of ABC

- Develop a data collection template
  - Recommend that we use BCI framework
- Analyze 8 ABC projects, completed under the Highway for LIFE program.
- Use archival records and/or interviews to summarize project characteristics, cost data, and specific elements of ABC that were applied
Bridge Construction Impact (BCI)

BCI index is used to evaluate different structural alternatives in decision making.

This criteria set can help to identify and characterize structure types and projects.

- **Facility Category**
  - I. Residential community traffic
  - II. Local streets (business and residential)
  - III. State routes, major city arterials, or minor utilities (water channel etc.)
  - IV. Interstate or State Highways
  - V. Essential artery, major landmark facilities, utilities, or natural hazard (waterways, swamp lands, etc.)

- **Mission Impact Type**
  - Capacity Improvement/Restoration: Improve or restore capacity to relief existing traffic congestion due to an event, incident, or demand growth.
    - C1 - Lanes and shoulder widen, soundwall addition, and add/restore 1-30% of total lanes and/or shoulder widen.
    - C2 - Add/restore 31-66% of total lanes + shoulder widen.
    - C3 - Add/restore 67-100% of total lanes + shoulder widen.

- **Traffic Impact Intensity**
  - Traffic Delay: Due to temporary construction-related operations on traffic congestion (number of days).
    - T1 - Reduce widths of lanes and shoulder, closure of 1-30% of total lanes and/or shoulder or lane realignment.
    - T2 - Closure of 31-66% of total lanes + shoulder.
    - T3 - Closure of 67-100% of total lanes + shoulder.

- **Environmental Impact Levels**: Due to temporary construction-related operations (number of days).
  - E1 - None to Mild
  - E2 - Moderate
  - E3 - Severe

- **Impact Measures**: in XX of YY-hour days (Z)
  - XX = Number of days; YY = Number of hours; Z = Type of hours:
    - PK = Peak, commuting and heavy traveled hours.
    - OP = Off-Peak, non-commuting and moderate traveled hours.
    - NS = Non-standard, light-traveled hours (e.g. midnight)
Discussion
Discussion

- Additional reports that we have missed
- Synthesized findings (consistent or not with TAC member experiences)
- Decision-making tools
- Next face-to-face TAC meeting purpose