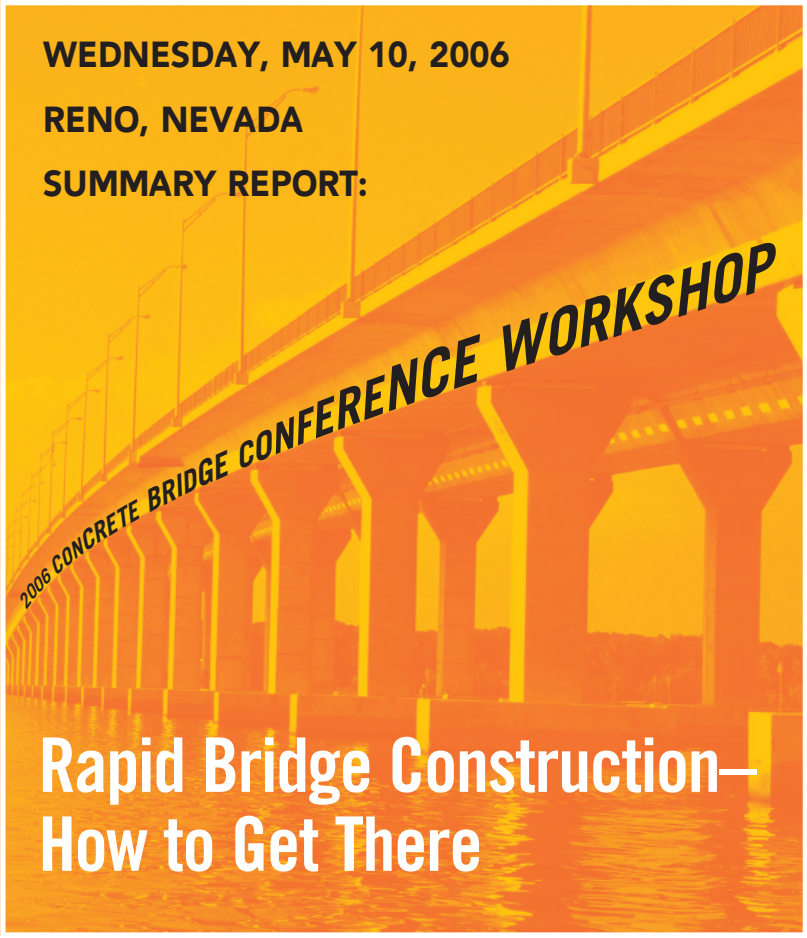
WEDNESDAY, MAY 10, 2006

RENO, NEVADA

SUMMARY REPORT:



2006 CONCRETE BRIDGE CONFERENCE WORKSHOP

Rapid Bridge Construction—How to Get There

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Background

The benefits of accelerated bridge construction are well known. They include minimized traffic disruption and congestion, improved work zone safety, and minimized environmental impact. Additionally, prefabrication can improve constructability, increase quality, and lower life-cycle costs. As was seen during the 2004 FHWA / AASHTO / NCHRP Prefabricated Bridge Elements and Systems international scanning tour, rapid bridge construction is prevalent in urban areas of Europe and Japan. It has been employed less frequently in the U.S. mainly because of the lack of knowledge and limitations on contract strategies, guide specifications, and availability of equipment and specialty contractors.

Purpose

The purpose of this full-day workshop was to develop guidance on what is needed to further implement rapid bridge construction nationwide in each of four topic areas: decision-making process, contracting strategies, costs, and specifications.

Process

The workshop featured presentations by a panel of experts representing the Federal Highway Administration, State Departments of Transportation, contractors and others in the morning, followed by brainstorming breakout sessions among the participants in the afternoon. The morning panel presentations were each a maximum 15 minutes in length. In the afternoon, facilitators gave their thoughts in the first 5 to 10 minutes of the breakout session to stimulate the brainstorming and discussions that followed. Scribes took notes during the discussions.

Facilitators reported the outcomes of their session participants' discussions in a general session during the last hour of the workshop. The outcomes of the breakout sessions were guidance on what is needed to further implement rapid bridge construction nationwide in each of four topic areas: decision-making process, contracting strategies, costs, and specifications.

Program

Workshop Co-Chairs: Benjamin Tang, Federal Highway Administration and Mary Lou Ralls, Principal, Ralls Newman, LLC

Morning Panel of Experts Presentations, Part I

Moderator: Benjamin Tang, Principal Structural Engineer, Federal Highway Administration

AASHTO Perspective
Ken Hurst, Engineering Manager, State Bridge Office, Kansas Department of Transportation

Federal Bridge Program in SAFETEA-LU
Benjamin Tang, Principal Structural Engineer, Federal Highway Administration

Decision-Making Process
Mary Lou Ralls, Principal, Ralls Newman, LLC

Contracting Strategies
Malcolm Kerley, Chair, AASHTO Subcommittee on Bridges and Structures, and Chief Engineer, Virginia Department of Transportation

Cost
Harry Capers, Manager, Office of Transportation Security, New Jersey Department of Transportation

Morning Panel of Experts Presentations, Part II

Moderator: Eugene Calvert, Principal Project Manager, Collier County Transportation Services Division, FL

Design and Specifications
Daniel Dorgan, Director, Bridges and Structures, Minnesota Department of Transportation

Concrete Industry Perspective
David Bilow, Director, Engineered Structures, Portland Cement Association

General Contractor Perspective
William Duguay, Traylor Brothers, Inc.

Specialty Contractor Perspective
Bill Halsband, Vice President, Business Development, Mammoet

Specialty Contractor Perspective
Will Smith, Barnhart Crane and Rigging

Afternoon Breakout Sessions

*Decision-making Process*Facilitator: Benjamin Tang, Senior Structural Engineer, Federal Highway Administration
Scribe: Mary Lou Ralls, Principal, Ralls Newman, LLC
Topics include justification for accelerated construction, size of prefabrication, drivers and construction workers safety, environmental impacts, rapid disaster recovery

Contracting Strategies
Facilitator: Ken Hurst, Engineering Manager, State Bridge Office, Kansas Department of Transportation
Scribe: Brad Chapman, Structural Engineer, Virginia Department of Transportation
Topics include single or multiple contracts, design/build, bonus/penalty/liquidated damages, bonding, request for proposal, sharing of Value Engineering Change Proposal savings, contractor alternate designs

Costs
Facilitator: William Duguay, Traylor Brothers, Inc.
Scribe: Harry Capers, Manager, Office of Transportation Security, New Jersey Department of Transportation
Topics include cost impacts due to accelerated construction, user costs, costs related to DOT field offices and on-site inspectors, environmental costs (air and noise pollution), lane rental cost, traffic control cost, time savings, Value Engineering Change Proposal

Specifications
Facilitator: Paul Liles, Jr., State Bridge Engineer, Georgia Department of Transportation
Scribe: Paul Rowekamp, North Region Bridge Construction Engineer, Minnesota Department of Transportation
Topics include acceptance criteria, tolerances, contractor submittals, design, QAQC, construction monitoring and inspection, construction schedule, special provisions

Participants

Sohila Bemanian, Nevada DOT

Shri Bhidé, Portland Cement Association

David Bilow, Portland Cement Association

Joan Bowser, New Mexico DOT

Eugene Calvert, Collier County, FL

Harry Capers, New Jersey DOT

Brad Chapman, Virginia DOT

Dan Dorgan, Minnesota DOT

William Duguay, Traylor Brothers, Inc.

Doug Edwards, FHWA

Dan Gotta, Stantec Consulting

Bill Halsband, Mammoet

Ken Hurst, Kansas DOT

Lynn Iaquinta, HDR Inc.

Gary Jakovich, FHWA

Mal Kerley, Virginia DOT

David Kramer, Contractor's Engineer, Inc.

Paul Liles, Georgia DOT

Troy Martin, Nevada DOT

Mark McDonald, Lonco, Inc.

William Nash, McCarthy Building Companies, Inc.

M. Nasir Nasim, WMATA

Celik Ozyildirim, VTRC-VDOT

Terry Philbin, FHWA

Bernard Ponte, Nevada DOT

Basile Rabbat, Portland Cement Association

Mary Lou Ralls, Ralls-Newman LLC

Paul Rowekamp, Minnesota DOT

Aziz Saber, Louisiana Technical University

William Smith, Barnhart

Michael Sprinkel, VTRC-VDOT

Izhak Stern, I. Stern - Y.D.E. Engineers Ltd.

Ben Tang, FHWA

Kevin Thompson, California DOT

Lou Triandafilou, FHWA

Outcomes

Summaries of the discussion outcomes from the afternoon breakout sessions are given below for each of the topic areas: decision-making process, contracting strategies, costs, and specifications. The discussions focus on what is needed in each topic area to further implement rapid bridge construction. An attempt has been made to put the outcomes from each topic area into a similar format. Some duplication naturally exists across topic areas.

The discussions presented below are those of the participants in the sessions and are not intended to represent all the issues or potential solutions that may be available. It is hoped that bridge professionals will review use the discussions and proposed actions and become champions to meet the needsadvance the use of rapid bridge construction.

Timelines to accomplish the recommended actions were not developed in this workshop.

1. Decision-making Process

The participants agreed that the owners should lead the rapid bridge construction change process, working with contractors and other bridge professionals. They felt that enough information is currently available for bridge owners to implement prefabrication as they deem appropriate. Participants also felt that the use of prefabrication should not be a policy or be mandated, but instead should be used when it is a good business decision.

Participants discussed the impact of prefabrication on contractor operations. Contractors must make a profit to stay in business, and owners want contractors to stay in business to compete on future bridge projects. Accelerating bridge projects allows the contractor to complete more projects in a given amount of time, which should increase the contractor's profits. Bridge owners must share the risks inherent with innovation and help the contractors to be successful on these projects. Bridge owners need to support and encourage contractors' proposals to accelerate projects by committing to quick turn around in the review and approval process. This commitment should be communicated in writing to the contractor during the bidding process.

Additional discussion on what is needed related to the decision-making process to further implement rapid bridge construction is summarized below.

Actions that owners can take to further implement rapid onsite bridge construction:

- Develop a standard decision-making process that considers prefabrication on a project-by-project basis. The FHWA "Framework for Prefabricated Bridge Elements and Systems (PBES) Decision-Making" is available at http://www.fhwa.dot.gov/bridge/prefab/framework.cfm for this process.
- Obtain contractor input early in the decision-making process. Review constructability of prefabrication at the preliminary engineering stage, including contractors and suppliers in this review process.
- Capture all costs in evaluating whether prefabrication is the best choice for a project. Include delay-related user costs in the decision-making process. Identify benefits to provide cost/benefit numbers for decision-makers. Consider union issues, e.g., maximum labor hours per day and impact of double or triple shifts. Consider cost of day versus night work. Consider the maintenance-of-traffic costs, e.g., a couple rolling roadblocks to install prefabricated bridges versus multiple full-lane night closures for conventional construction. Consider detour maintenance and repair costs for extended use versus short-term use.

- Consider limited work windows that may be driving the schedule, e.g., less than 8 hours in urban areas and limitations that require night and weekend work only. Work with those that are driving the limited work windows, e.g., local permitting agencies and local governments.
- Include a contractor (not bidding on the job) and a public affairs person on the consultant design team.
- Give contractors an economic incentive to innovate and to buy in to the owner's reduced onsite construction timeline, e.g., bonuses and commitment of long-term widespread use.
- Reduce the contractor's risk; share the risk (e.g., clearly define goals, maximize the use of prefabrication, provide complete quality contract documents, reduce bond requirements and insurance, reduce time-related overhead). Put each risk on the one that can most effectively handle it.
- Increase contractor's options, e.g., Cost Reduction Incentive Proposal (CRIP) where contractor can propose a change to the contract with equal sharing of cost savings with owner.
- Allow the contractor to have the flexibility to work with the fabricator on beam type and details.
- Help the small contractor, such as a contractor that does work in only one state, to consider the use of prefabrication, e.g., bundle multiple bridges in one contract.
- Look at means and methods used on emergency projects that may also be used for non-emergency cases to speed onsite construction while maintaining the quality.
- Consider furnishing key materials for the project.
- Identify roadblocks that inhibit prefabrication, and then work to address those roadblocks. For example, provide examples of good connection details for prefabricated components so that owners can have confidence in quality long-term performance of the connections.
- Promote regional standardization and repetitive use of standard shapes, e.g., as is currently being done in one region where FHWA and State DOTs are meeting to standardize fabrication details. Regional standardization allows prefabrication plants to fabricate components for different states using standardized details and fewer forms. Determine the economic advantages that can result from the use of regional standardization.
- Conduct internal training for better understanding of the technologies and the possibilities that are available when using these technologies.
- Initiate public informational outreach at the preliminary planning stage, e.g., town hall meetings. Meet with the businesses, including mom-and-pop companies. Show renderings of structure types and discuss construction timelines. Solicit input.
- Ways that the bridge engineering community can help owners and contractors embrace the use of rapid bridge construction:
- Work with coalitions of local government(s) to educate, promote, and expand the use of prefabrication for rapid onsite construction.
- Assist local governments in stockpiling typical prefabricated bridge components that can be used on upcoming programmed projects as well as emergency projects to gain speed and obtain lower costs. Determine which standard components should be prefabricated, and at which lengths. Determine funding mechanisms for prefabricating components without a project. Address the issue of limiting the contractor's flexibility when using owner-supplied materials. (Note: Collier County in Florida is developing a pilot program for stockpiling components for their upcoming county bridge projects.)
- Develop cost-effective aesthetic options in prefabricated systems.
- Share lessons learned to help all gain confidence in using rapid bridge construction.
- Recommended additions to the FHWA "Framework for Prefabricated Bridge Elements and Systems (PBES) Decision-Making" to help bridge owners in their decision on whether they should consider the use of prefabrication for rapid bridge construction:
- Include public involvement to obtain buy-in from those to be impacted by the project. For example, meet with safety response personnel and businesses to compare impacts from conventional construction with extended closures versus accelerated construction with night or weekend closures.
- Include examples of innovative contracting strategies.
- Include discussion of Capacity-protected Design (CPD) features. For example, owners want any earthquake damage to occur in the column where it is visible and repairable; plastic hinging is forced into the columns with well-confined sections to control the damage.
- Instead of "Use prefabrication" say "Use of prefabrication beneficial" or "Prefabrication advantageous" or "Consider the use of prefabrication".

2. Contracting Strategies

Discussion on what is needed related to contracting strategies to further implement rapid bridge construction is summarized below.

Use early steel letting of portions of the project to help ensure the critical path of the project is not affected.

- Use incentive/disincentive payments for reaching certain milestones through the project development. For example, use incentives/disincentives on a project where a major interstate is required to be shut down for a certain amount of time.
- Award incentives for reaching a target date, and assess relatively larger disincentives for not meeting the required date.
- Be clear in defining the "quality" of a certain product in A+B (time + money) bidding.

Design/Build:

- Dedicate staff to the project; decisions must be made quickly.
- Owner must decide how specific to be on design details.
- Make the first design/build project a typical bread-and-butter type structure, and select the designer from an approved list.

- Best Value Model:
- Once proposal is given, ratings will be assigned to certain specific technical sections in the proposal.
- This is to done to better address overall quality instead of awarding the contract to strictly the lowest bidder.

One-Step Design/Build:

- Owner awards a contract to a team of contractor and designer based on qualification.
- Guaranteed not to exceed prices negotiated upon 90% of design completion.

Construction Manager at Risk:

- Owner awards 2 contracts, one to the engineer and one to the contractor and they work parallel with one another throughout the life of the contract.
- Lump sum contract.

Value Engineering:

- Before letting, the original purpose was should be to satisfy both industriesspur competition among competing options.
- Before letting, minor changes may be suggested and/or investigated such as material strength, but NOT number of spans in the layout.
- After letting, contractor may provide an alternate of equal or better quality, and the cost savings will then be reviewed.

What other states have done to reduce contractor claims:

- Use design/build; however, pay up front for risk allocation.
- Place the appropriate decision-making personnel in the field in order to respond to the problems as they occur.
- Require CPM to be submitted with the bid, and check if delay to of the contract affected the project's critical path.
- If consultant is responsible for delay to the contractor, hold the consultant responsible.

3. Costs

FHWA did a study about rising construction costs. AGC also just published data on transportation costs in the past two years, to show a breakdown on materials, etc. Contractors cost out the bids based on conventional methods. The value of an innovative rapid bridge construction project needs to be determined in order to justify costs if those costs are higher.

Additional discussion on what is needed related to costs to further implement rapid bridge construction is summarized below.

- Find a champion to lead the new technology implementation. Leadership by a champion is needed. Generally this leader/champion is in the owner's organization. Contractors are a reflection of the agency for which they work. A champion, however, can be any bridge professional in the industry.
- Develop objective-based pre-qualification criteria that do not limit startup-type opportunities for contractors.
- Demonstrate mutual respect at the job level.
- Determine a reasonable cost for implementing innovation. Find better ways to compare and analyze average historical unit costs vs. new ideas.
- Determine whether to use a different level of Contingency contingency for projects with innovation.
- Improve communications with contractors to get their buy-in to new innovation.
- Improve Owner-Designer-Contractor relationships.
- Solicit contractor input in the design or scoping phase of a project. Partner with the contractor on implementation. Ask for contractor input as one of the project's "customers."
- Welcome specialty contractors into agencies to "educate" owners/designers on what is possible with their new or innovative technologies/methods.
- Develop specifications that have suitable backbone to level the playing field for all parties. The specifications should be well written and clearly define the owner's expectations.
- Identify a national model for user-cost analysis to determine benefits of implementation, considering lane-rental costs, road-user delays, life-cycle costs, bonus-penalty clauses, value engineering, etc.
- Set the bonus/penalty amount high enough to induce the desired behavior, regardless of the actual user cost.
- FHWA should gather and maintain a database of specifications and cost analysis for innovations.

4. Specifications

Discussion on what is needed related to specifications to further implement rapid bridge construction is summarized below.

Specifications – Split into 3 Areas:

- Specifications to speed up work from a contractual standpoint:
- A+B contracting
- Incentive/Disincentive
- Value engineering
- Design Build
- 30% Plans – for bidding
- Flexible work periods
- Stockpile critical materials
- Local constraints
- Prequalification

Specifications to speed up work from a materials/design standpoint:

- Precast elements
- Performance specifications
- QA/QC

- Innovative materials - inspection/testing
- Consult w/ industry/fabricators
- Allow alternate structure types
- Require mock-ups
- Tolerances

Other:

- Shop drawing submittals
- Integrated shop drawings
- Electronic submittals and approvals
- Erection submittals
- Realistic submittal times

- Consider specific limits in the contract provisions (e.g., 3 weekend closures, one 7-day period, etc.) for road closures on long-term construction contracts.
- Provide room for contractor innovation and options (within limits if necessary). Allow value engineering.
- Try to provide an erection sequence or staging plan, but allow for contractor submittal of other options (with deadlines for submittals and approvals). Require engineer stamp if needed.
- Consult with industry (fabricators, material suppliers and contractors) to review draft shapes, techniques, methods, etc.
- Develop specifications to allow alternate structure types (or list options that would be considered).
- Allow bids on 30% plans – allows some innovation and may reduce project time.
- On a project basis, consider the difference between total "Project Time" (from design through construction), and "Road Closure" time (specific limits on road closures, detours, etc). Consider requiring a contingency plan, alternate routes, detours.
- In the development of incentives and disincentives, talk with contractors, balance insurance costs, labor costs, bonding costs, etc. Incentive/disincentive projects can reduce arguments on minor contract issues (don't waste time fighting small battles).
- Work with contract administration personnel to make sure that plan or shop drawing or other required submittals have review times that are realistic (make sure staff will be available), particularly for Design/Build projects.
- Consider integrated shop drawings (on design/build projects).
- Electronic submittals may save time.
- Consider the use of higher-strength reinforcement than is currently allowed in the AASHTO Bridge Design Specifications.
- Consider stockpiling (pre-purchase of materials with critical production time).
- Consider separate letting for steel girderskey materials.
- Make sure material properties are tested at appropriate time frames (28-day versus 56-day properties for strength, permeability, etc.) for acceptance criteria (performance specifications).
- Make sure contract times and letting dates allow time for necessary testing and submittals. Require specific quality control measures (trial batches, historical data, etc.). Consider test placements in other parts of the structure prior to a deck placement.
- Ensure that prefabricated products allow tolerance for fit with field constructed items.
- Consider requiring "mock-ups" or test panels to work out the bugs prior to final placement or construction.
- For QA/QC, may need to consider alternate acceptance methods, instrumentation, maturity methods; also consider staffing impacts (weekends, late hours). List clear substitutes for tests or methods or minimum time requirements (i.e., make clear that curing times will not be waved regardless of other test results (if appropriate). May require higher level of inspection effort (grouting, tensioning, etc).
- For construction schedule, consider local ordinances, daylight, and neighborhoods. Notify the local community and stakeholders of the project. May need variances, etc.
- Prequalification of contractors can be difficult and political, and also time consuming.
- Consider co-existing review teams on large projects.
- Determine which components of precast bridge structures to for standardization. Obtain input on this standardization from FHWA, AASHTO, State DOTs, contractors, suppliers, and consulting engineers. Develop a time frame to implement these standards.

Conclusions

The workshop participants are representatives of State DOTs, local governments, contractors, suppliers, consultants, academia, professional organizations, and FHWA. The excellent quality of the outcomes is the result of this diverse group of bridge professionals. The sponsors of the workshop thank the participants for their presentations in the morning sessions and their input during the afternoon breakout sessions.

As previously mentioned, it is hoped that bridge professionals across the country will review the discussions and proposed actions, and become champions to begin addressing the various identified needs. The efforts of all are appreciated in this initiative to further implement rapid bridge construction nationwide.