

INNOVATIVE CONTRACTING FOR MAJOR TRANSPORTATION PROJECTS

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EXECUTIVE SUMMARY

This report summarizes the development and delivery of a workshop for state highway agency CEOs and senior managers responsible for highway construction contracting. The workshop was held at the AASHTO 2005 annual meeting in Nashville, Tennessee. It provided information concerning innovative contracting practices for transportation projects, focusing specifically on design-build delivery, best-value procurement, and construction warranties. It discussed recent trends in the industry, and provided state highway agency CEOs and managers with information needed to identify projects and implement innovative contracting methods to reduce construction time and life-cycle costs, improve quality, and enhance customer satisfaction.

INTRODUCTION AND MOTIVATION

Since 1990, FHWA has been implementing alternative contracting methods under its Special Experimental Project No. 14 (SEP-14)¹. Many states have successfully implemented experimental methods such as design-build, cost plus time bidding, incentives/disincentives, lane rental, and others. States continue to develop, experiment with, and successfully implement innovative contracting methods under SEP-14.

In 1996, the FHWA decided that cost-plus-time bidding, lane rental, and warranty clauses were no longer experimental. The FHWA issued a final rule for design-build in 2002 that allows design-build on qualified projects without SEP-14 approval, and for unqualified projects when approved for use through SEP-14. Within the last year, the FHWA initiated SEP-15² to encourage states to experiment with innovative ways to finance and deliver transportation projects. The recent passage of SAFETEA-LU³ in July 2005 further promotes the use of innovative finance, design-build, and alternative contracting through innovative financing programs, increased flexibility in project selection, environmental streamlining, and expedited procurement.

In the past several years, transitions have occurred at the senior management level within many state transportation departments. Newer CEOs and their senior managers are keenly interested in investigating and adopting innovative contracting practices to deliver projects more efficiently, and improve the quality and performance of construction. This workshop was designed to provide current information to CEOs and their senior managers that decide on the contracting methods used in their state.

APPROACH

The work essentially involved three Tasks: 1) Collect information regarding innovative contracting methods and select 3-4 promising methods to present to CEOs and their senior managers, 2) develop and present the 1-day workshop, and 3) prepare a report summarizing the results of Tasks 1 and 2.

TASK 1 – Collect Information and Select Innovative Contracting Methods

The research effort focused on existing literature, instructional courses, and results of past research on innovative contracting methods. Table 1 below identifies the various alternative project delivery, procurement methods, and contract management methods that states have used or experimented with. This list was derived from the Fourth Edition of the AASHTO Primer on Contracting for the 21st Century⁴ and the recently developed National Highway Institute training course entitled “Alternative Contracting.”⁵ The objective of the research was to select one method from each of the three categories for presentation at the workshop.

Table 1. Alternative Contracting

Project Delivery Methods

- Indefinite Delivery/Indefinite Quantity
- Agency Construction Manager
- Construction Manager at Risk
- Design-Build, including numerous variations
- Public-Private Partnership

Procurement Methods

- Lump Sum Bidding
- Reverse Auction Bidding
- Bid Averaging
- Alternate Bid
- Additive Alternate
- Best-Value
- Cost Plus Time (A + B)

- Multi-Parameter Bidding (A + B + C +...)
- Alternate Design
- Qualifications-Based Selection (QBS)

Contract Management Methods

- Pre-Construction Workshops
- Alternate Dispute Resolution
- Incentive/Disincentive
- Lane Rental
- No Excuse Incentive
- Active Management Payment Mechanism
- Flexible Notice to Proceed Dates (Flexible NTP)
- Quality-Based Specifications
- Performance-Related Specifications
- Long-Term Warranties
- Constructability Reviews

As the list indicates, there are a host of alternative procurement and contracting methods currently used by states. To select the methods to be included in the seminar, the list was reduced to include only those methods that are qualified for use under SEP-14 or SEP-15, have been the subject of considerable interest and debate within the industry, and would potentially provide the most significant advantages on major highway projects over traditional contracting methods in the areas of cost, time, or minimizing impacts to the traveling public. The discussion below summarizes the rationale for selecting the alternative methods to be presented at the seminar. These are separated into the appropriate categories.

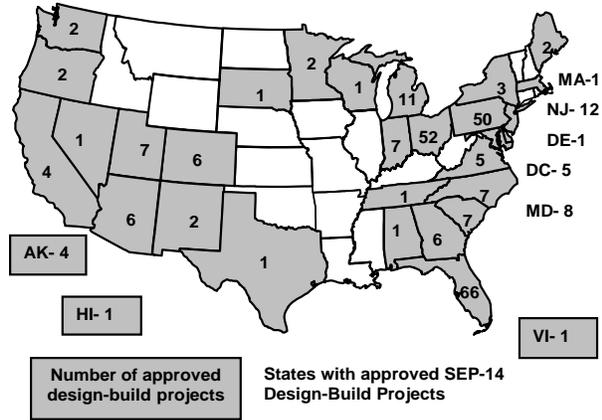


Figure 1: Approved SEP 14 Design-Build Projects

- Project Delivery -

Two project delivery methods appeared to be well suited for large, multi-phase highway projects making them candidates for the seminar. These were Agency Construction Manager (Agency or at-risk CM) and Design-build. Construction Manager, at-Risk or Agency, has the potential to significantly reduce the cost and time to deliver a major project and has a proven track record in the vertical construction industry. However, this project delivery method has not been widely used for large highway construction projects or has had mixed cost and time performance. Agency CM or Program Management (PM) was used to deliver the Boston Central Artery project (Big Dig), and continues to be used on a small number of similar highway mega-construction programs. In contrast, design-build delivery has been implemented on a wide variety of highway projects, has a proven track record in reducing the time to deliver a project,

and as shown in Figure 1, its use has dramatically increased in the highway industry with the passage of enabling legislation and implementation of design-build programs in various states.

The researchers concluded that that Design-build would generate the most discussion and was an area where agencies were experimenting with variations to achieve greater savings to both project cost and time. For example, the Maine DOT is successfully delivering a major highway project, the Prospect-Verona Bridge, using a variation labeled “Facilitated Design-Build.”⁶ In response to the research, the Maine DOT agreed to present information about its design-build program, including “Facilitated Design-Build” at the seminar.

- Procurement -

All but two of the procurement methods, Bid Averaging and Reverse Auction Bidding, qualify for federal funds under SEP-14. With FHWA approval less a factor, selection of a procurement method was based on whether or not the method was experimental under SEP-14, generated significant interest, and had potential for cost, time, or quality improvements for major projects. Best-Value procurement was chosen for this workshop based on:

- Discussions held concerning the potential advantages of Best-Value procurement for highway construction at recent AASHTO meetings including the 2004 and 2005 Subcommittee for Construction annual meetings.
- Integration of Best-Value procurement into the FHWA Highways for Life program as part of the SAFETEA-LU legislation.
- NCHRP 10-61⁷, a recent NCHRP study addressing the implementation of Best-Value procurement for highway construction being published in 2006.

- Best-Value presenting more options in terms of a one-step or two-step process in conjunction with traditional design-bid-build, design-build, or CM forms of delivery.
- Highway agencies, for example Florida DOT, intend to use Best-Value procurement for traditional projects using pilot programs as well as for design-build delivery.

- Contract Management -

Contract management methods can be categorized in terms of general provisions, specifications, or contracting methods that save time, enhance quality, or achieve multiple objectives. There are also fewer legal and administrative restrictions on the use of the contract management methods compared to project delivery and procurement methods. Some of these methods, for example, Incentives/Disincentives, have a long history of use, are no longer considered experimental, and thus, were not considered for this forum. Though long-term construction warranties are no longer considered experimental, they continue to generate considerable interest and controversy. Long-term warranties have been used by a large number of agencies, and have shown tremendous potential to improve quality, but issues have arisen regarding cost, risk allocation and control, and liability for deficient performance under the warranty. Because of the level of interest, continued growth, and debate, it was decided to examine the use of construction warranties in the workshop.

In summary, the seminar addressed the following respective alternative delivery, procurement, and contracting methods: *design-build delivery, best-value procurement, and long-term warranty provisions.*

TASK 2—Workshop Development

The presentation was structured as a five hour workshop with approximately four hours of presentation and discussion time. The agenda is attached under Exhibit 1. The presentation was designed to be as interactive as possible, providing attendees with the opportunity to discuss possible procedures to select and implement innovative contracting methods in their respective states. To build on past success, the organization of seminar materials and presentation techniques paralleled the recent CEO course, *Task Force on Accelerating Innovation in the Highway Industry*. The presentation with accompanying slide show shown in Exhibit 2, introduced and presented information for further discussion. Classroom handouts, Exhibit 3, provided information to supplement the lecture. Selected project experiences were also used to illustrate how contracting methods were implemented, relative advantages and disadvantages, and lessons learned. Finally, participants discussed the methods presented and were asked to offer suggestions to improve on current practices.

In addition to the materials developed for the seminar, the slide presentation and classroom handouts, Exhibit 3, includes materials prepared by the Maine DOT regarding its design-build delivery of two projects, one of which was the on-going construction of the Waldo-Hancock. Information about this bridge is also available at <http://www.waldohancockbridge.com/waldo-county-bridge/>

TASK 3 – Seminar Presentation

The Seminar was presented at the AASHTO Annual Meeting in Nashville, Tennessee on Friday, September 16, 2005. John Horsley, the Director of AASHTO provided opening remarks. Sidney Scott and Howard Klie of Trauner Consulting Services, Inc., and Ted Ferragut, of TDC Partners, LTD. facilitated the seminar. David A. Cole, the Commissioner of Transportation for

Maine, and Ken Sweeney, the Director of the Bureau of Project Development, presented information about Maine's design-build projects. The following states were represented: California, Colorado, Indiana, Louisiana, Maine, Missouri, Montana, Nevada, and Vermont. The list of attendees is provided in Exhibit 4.

During opening remarks, Mr. Horsley commented that this seminar was part of AASHTO's strategic plan to share innovations in how projects are managed and contracting methods that get projects done so they can serve the public. Following opening remarks, the seminar shifted to design-build delivery.

- Design-Build -

The design-build discussion included a 45-minute presentation of background information regarding design build. The presentation included definitions of design-build and its variations, statutes and regulations affecting design-build, typical design-build risks and issues, frequency of use among highway agencies throughout the United States, and benefits of use whether actual or perceived. The facilitators then asked for feedback from the group regarding their experience with design-build. The group offered the following comments:

- A variation of design-build might be to apply design-build principles to projects designed in-house. Assign a design team from the agency to a contractor. The design team would work with the contractor more like the designer of a design-build entity instead of the designer working for the owner. This would build a team approach to completing a project, with less "finger-pointing".
- Consider build-to-budget projects using a negotiated contract with a fixed budget where the scope of the work is the negotiated variable.
- A variation may be to assign contracts procured by the state over to a contractor. For example, the state would procure a contract for design services and a contract

for construction. These contracts would be assigned to a “developer” to complete the design and construction contracts.

- California’s experience with design sequencing showed it saved time, but did not always avoid disputes typical with design-bid-build.
- DOT personnel still exercise too much control. Consequently, DOTs cannot take advantage of ideas from industry. Too many good ideas from industry are not considered because of restrictive specifications. DOTs generally start out being more restrictive, but should move to placing more emphasis on the end product.
- Indiana’s experience with design-build was that a design build program must become part of a DOTs core business to ensure a state can create and maintain an in-house expertise in this delivery system.

The design-build discussion continued with Maine DOT’s presentation of two design-build projects, the Sagadahoc Bridge and the Waldo-Hancock Bridge, which is currently under construction. The Sagadahoc Bridge used a classic two-step, best-value project delivery with a Request for Qualifications followed by a Request for Proposal. The approximately \$60M Project was completed within budget, ahead of schedule, and without significant issues. Points or lessons learned regarding classic design-build mentioned by Maine DOT were:

- Form teams of qualified people for both contract and construction management. Managing design-build projects is different from managing design-bid-build projects. If the state has no expertise in-house, consider forming an Advisory Team of experts to provide assistance during RFP development, contract procurement, and construction.
- Re-write applicable general provisions of the standard specifications. Allocate 90-120 days for this effort.
- Disclose geotechnical data that was verified as accurate to the design-builder when design-builder is at risk for subsurface conditions.

- Consider warranties on items such as joints, pavement, and bearings. In the case of finger joints with a warranty, the Maine DOT allowed the design-builder to use joints not specified in standard specifications
- Resist the temptation to restrict the means and methods of the design builder unless such restriction is necessary to meet the minimum needs of the DOT. Consider using confidential discussions (discussions kept from other bidders) during negotiations to determine which bidder has the best technical solution.
- Monitor design changes to ensure the minimum contract requirements met.
- Work with permitting agencies to issue permits or partial permits before design is complete. Maine negotiated an agreement with the US Coast Guard to issue the permit after contract award and all the plans were completed by the design-builder.
- Maine highlighted that there were differing site conditions that required changes to design of piles and that the design-builder clearly understood its risk as there was no request made for a contract change.

Overall, the participants agreed with the points presented by Maine. The group especially echoed that design-builders need control over the necessary means and methods to construct a project that meets the specified end-result requirements. As more risk shifts to a design-builder, a corresponding level of control over the means and methods must also shift to a design-builder.

-Facilitated Design-Build -

The Penobscot River Bridge currently under construction is using a variation of design-build, approved under SEP-14, called “facilitated design-build.” This project moved forward as an emergency contract to replace the existing Prospect-Verona Bridge (signature bridge but too old to maintain) with a new signature cable stay bridge. Essentially, Maine DOT facilitated a design-build partnership between its design and construction contractors to affect a more

accelerated fast-track project. The preliminary designer in essence became the design-build designer-of-record. As a consequence, the construction contract was awarded earlier in the design process than typical. Maine DOT issued an RFP for construction requiring that bidders estimate the cost of a bridge similar to that expected for the Penobscot River Bridge. In this way, Maine DOT was able to consider price as a factor for award, even though there was only a conceptual design for the bridge at the time.

Current information about construction cost and time indicate that the project will be very successful. Maine highlighted the following challenges/points regarding facilitated design build.

- Maine DOT placed itself in the middle of most key early decisions regarding bridge design and construction. These included preliminary bridge design decisions affecting aesthetics, construction time, construction cost, and construction means and methods. The benefit was that Maine could work with the designer and contractor to address the constructability concerns and evaluate the cost benefits of various alternatives before the construction cost was finalized and well before the construction started.
- Maine was able to maintain control over bridge aesthetics and the signature features of the bridge. For example, one pylon will have an elevator to a top-of- pylon observatory.
- The design contractor performed construction engineering as well as bridge design. A lesson learned was to better anticipate the scope of construction engineering and include this scope in the design contract.
- Facilitated design-build requires a strong partnership. Maine held the separate contracts for design and construction, but all parties signed a partnership agreement to formalize their working relationship. Under the teaming agreement, Maine DOT retained the authority to make timely decisions based on available information.

- Best-Value Procurement -

The discussion of best-value procurement started with a definition of best-value as a procurement process using price and additional factors compared to a traditional low bid cost-only procurement. The presentation addressed the objectives for using a best-value process, common best-value factors, how they are combined in an evaluation and selection plan, legal considerations, agency experience, and key issues and concerns.

The concept of best-value procurement ranged from a simple cost-plus-time bid process to a more complex and subjective two-step, best-value process used in conjunction with design-build delivery. Other possible applications in the highway industry included multi-parameter (A+B+C) bidding process using a C parameter for quality or a warranty, and the use of design or bid alternates. Key points highlighted were:

- Typical factors other than price included time, quality, qualifications, resources, experience, and design alternates
- Best value procurement can raise standards for bidders, reduce procurement risk, improve quality, reduce life-cycle cost, reduce time or cost, and promote innovation.
- The process can be a multi-parameter (A+B+C) bid process where B and C are non-price factors (representing time and quality) converted to an equivalent cost, or involve a two-step RFP process using a quantitative point scoring system or a qualitative cost-technical trade-off analysis.
- Concerns with Best-Value procurement are increased risk of bid protest, reduction in competition, industry concerns regarding fairness, and increased procurement cost or time.



Figure 2:
Best-Value System

Following the presentation, participants discussed their experiences and information about best-value initiatives within their states. The key points are summarized below.

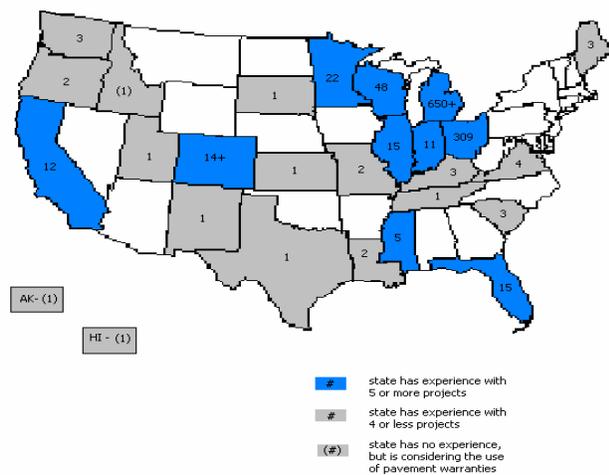
- Several states, including Vermont and Maine, have used a pre-qualification process for bidders using best-value procurements. Thus, the best-value concept is incorporated in prequalification processes.
- In Louisiana and Montana, A+B+C procurement was used to introduce life-cycle costs into an alternate pavement design. The states had to develop a method to adjust initial costs for the difference in maintenance costs between concrete and asphalt pavement designs. The local Association of General Contractors agreed to the adjustment method and factors. Thus far, contracts in Louisiana have been awarded to about the same number of concrete pavement and asphalt pavement designs.
- Colorado uses a build-to-budget process where bidders propose to complete items of work within an established budget. Each item of work is assigned a value for evaluation purposes. The contractor with the best value for the established budget is awarded the contract at the budget price.

- Warranties -

Ted Ferragut of TDC Partners, Ltd. provided an overview of the history and current status of warranties for highway construction. Warranties are used to protect against early failure, increase construction quality, reduce life

cycle costs, reduce agency resources, and promote innovation in materials and methods of construction. Some state agencies and local politicians see warranty projects as a new business

**Figure 3:
Number of Pavement Warranty Projects By State**



model designed to shift more responsibility for quality to the contractor. Contractors and industry representatives have historically opposed widespread implementation of warranties on the basis that their use reduces competition, imposes design-related risks on the contractor, and drives up cost. Despite these concerns, warranty use in the United States has steadily increased. As of 2003, warranties have been used 1200+ highway projects by more than 25 state agencies. It also has a history of use by selected agencies in Europe as documented in a recent FHWA-sponsored warranty Scan tour⁸.

The documented experience of the highway agencies that have implemented warranty contracting and analyzed the impacts of this implementation indicates that most of the objectives of warranty contracting have been accomplished in these states. Wisconsin DOT⁹ reported that warranted projects have performed better than non-warranted projects. Furthermore, it was indicated that the warranted projects cost less than non-warranted projects when factoring in agency inspection costs. Colorado DOT¹⁰ reported that the additional cost associated with using warranties was negligible. Indiana DOT¹¹ indicated that warranted pavements provided a lower and more consistent IRI and resulted in less rutting than the non-warranted pavements. Although the initial capital costs for warranted projects were approximately 10 percent higher than non-warranted projects, it was estimated that the use of warranties as a pavement preservation strategy could produce cost savings of 27 percent. Ohio DOT¹² observed an increase in bid prices for warranted projects. Warranted asphalt pavement bid prices were 8.5 percent higher than similar non-warranted asphalt pavements and warranted concrete pavement bid prices were 11 percent higher than similar non-warranted concrete pavements.

While some practitioners have reported that the use of pavement warranties in the U.S. have resulted in improved quality, reduction in premature failures, and reduced cost, the overall reported results have been mixed. This may be in part, due to how pavement warranties have been implemented and for what kinds of projects. In the case of Ohio, warranty projects were legislatively mandated for a percentage of the construction program. This and other factors may have had a negative affect on bid prices in the short term as indicated in Ohio DOT's implementation report. For states with limited experience, warranties have been selected on an ad hoc basis or in conjunction with design-build contracting without defined policies or procedures or careful consideration of appropriate project characteristics.

The findings from a 2003 Michigan symposium¹³ on warranties pointed to benefits, key issues, and observations. The anticipated benefits included improved quality, promotion of innovation, ability to address shortages in agency personnel, and public support. Key issues included the warranty type and length, selection of performance indicators and setting distress thresholds, bonding risks, and the degree of contractor input in the design related to some extent to the choice of contracting method. Almost all agreed that warranties should be used selectively, project selection was critical; and agencies should develop specifications, and guidelines to improve the use and value of warranties.

As warranty use evolved, two general categories of warranties have emerged, a material and workmanship warranty, and a performance warranty. Material and workmanship warranties are usually short-term warranties, possibly 1 to 3 years, and use prescriptive specifications. Performance warranties are usually long-term warranties, typically 5 to 10 years, and specify performance parameters. Under performance warranties the contractor will have greater responsibility for design and repair of design-related performance problems.

Warranty projects have resulted in management issues for both the contractor and owner related to competition, bid prices, bonding, real causes of failure, scope of repair, and control of work. There was general consensus that as the warranty period increases there must be a corresponding increase in design responsibility placed on the warrantor. This can be effected by using warranties in conjunction with design-build contracts or using end-result specifications allowing contractor greater latitude in the selection of materials and mix designs and less oversight by the DOT. The discussion regarding warranties also addressed solutions to bonding issues. Pre-qualification is used as an alternative to bonding in Florida to guarantee performance. Some states are willing to release the bond in yearly increments, thereby providing the contractor with a “cash flow” as the warranty period progresses.

Looking into the crystal ball, the following observations were made:

- Warranty contracting appears to be on the rise,
- The trend is towards greater contractor responsibility and less DOT oversight under warranty provisions,
- Pavement warranties will move to full depth sections,
- Warranty bonds will transition to guarantees or insurance instruments, and
- Performance warranties will become more of the standard practice for design-build and Public-Private-Partnership projects.

CONCLUSIONS

The seminar reinforced the success of three alternative contracting methods, design-build project delivery, best-value procurement, and warranties. The use of alternative methods will expand because they provide decision makers with practical steps to successfully select and implement contract strategies that reduce time, raise quality, enhance cost-efficiency, reduce life-cycle costs, and improve customer satisfaction. The Penobscot Crossing Bridge highlighted by the Maine DOT showed that states are continually looking for better ways to deliver projects to the highway users, and information about projects like this one needs to be gathered and disseminated to the rest of the highway industry in similar forums.

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